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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1910.

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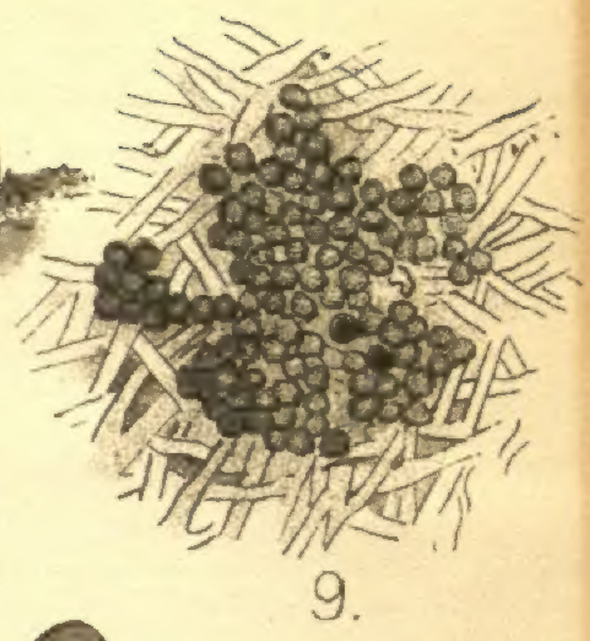
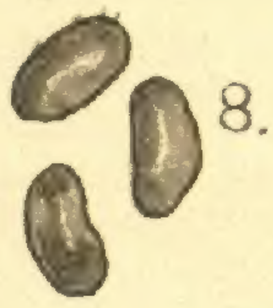
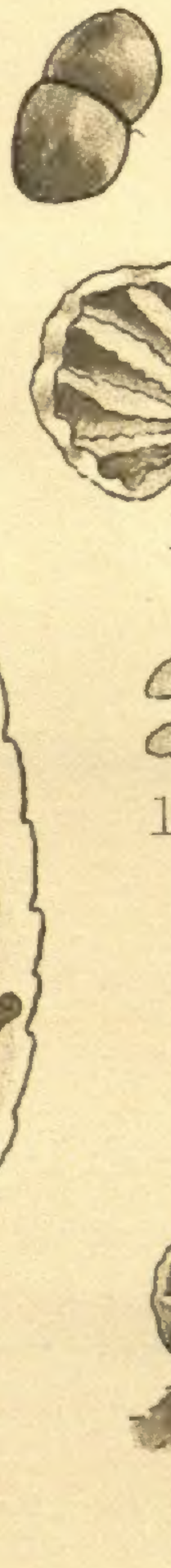
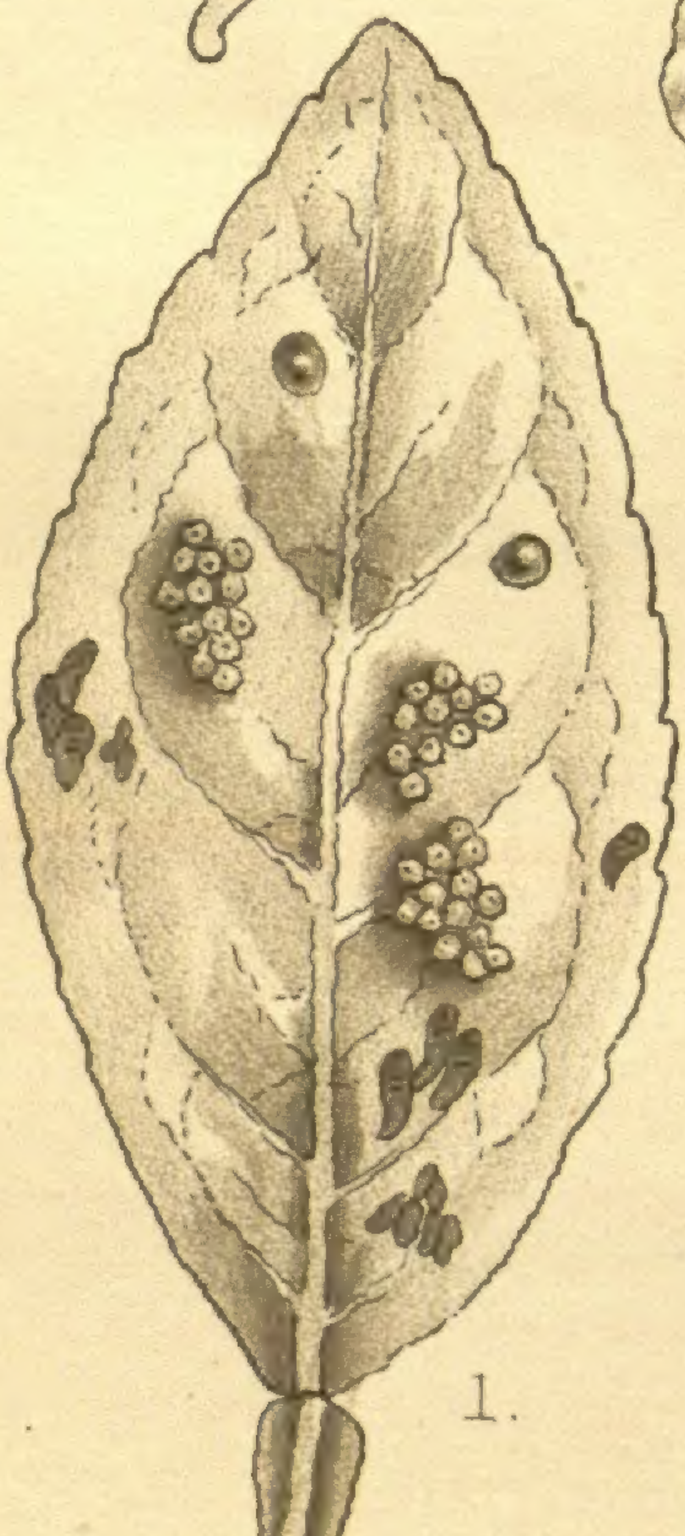
Errata.

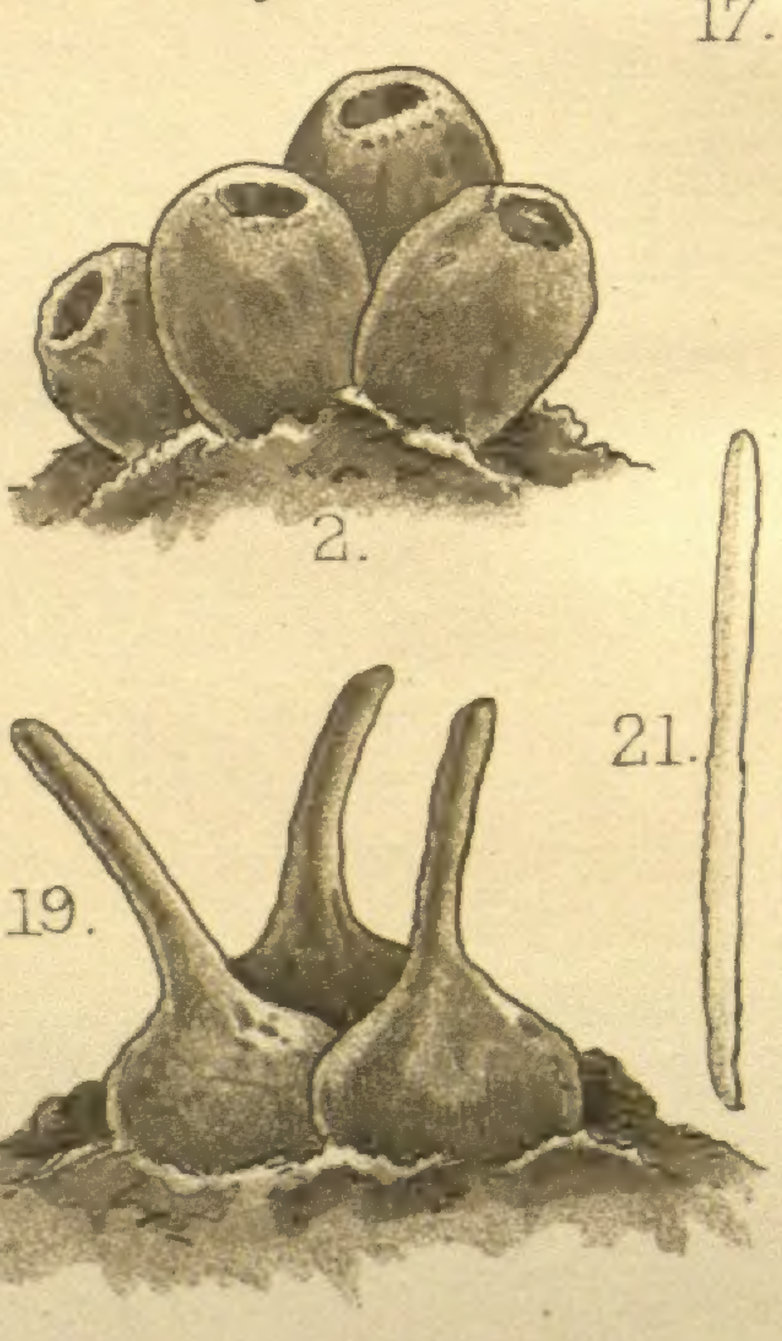
Page 139, line 5 from top, for *owariensss* read *owariensis*.
Page 141, line 25 from top, for *Voandezia* read *Voandzeia*.
Page 157, line 23 from top, *for* select *read* Selangor.
Page 167, line 21 from top, *for* Pflarzenfamilien *read* Pflanzenfamilien.
Page 174, line 21 from top, *for* **Portya** *read* **Pertya**.
Page 325, line 11 from top, *for* xvii *read* xxvii.
Page 327, lines 15 and 19 from bottom, *for* 'kewense' *read* kewensis.

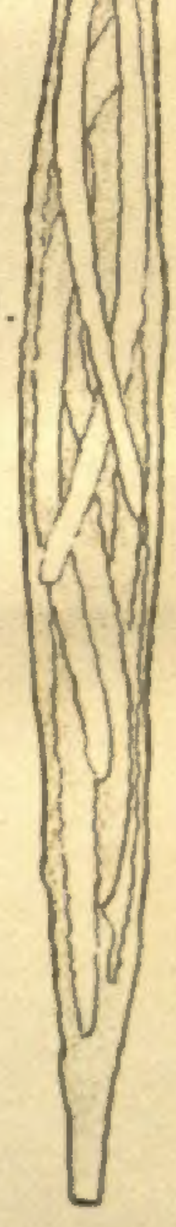












Fungi Exotici.

[To face page 1.

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I.—FUNGI EXOTICI: X.

(With Plate.)

G. Massee.

The majority of the new fungi, described in the following pages, have been received from the West Indies. A few are from Tropical Africa and elsewhere. *Marasmius scandens* is a parasite on Cacao in West Africa, and causes considerable damage to the plants. Another new fungus of interest is *Diplodia rapax*, which appears to be parasitic on the branches and roots of *Hevea brasiliensis*; this fungus was received almost simultaneously from Singapore and from West Africa. Two of the fungi described may be parasitic on insects, viz.: *Scleroderris gigaspora*, on scale insects on the leaves of the orange tree, and *Septocylindrium suspectum* on the bodies of "Frog-hoppers." Both these fungi require investigation under natural conditions as, if their true parasitism should be established, they may prove to be of some economic importance.

Agaricaceae.

Amanita calabarica, *Massee*.

Pileus carnosus, e convexo-hemispherico explanatus, glaber, siccus, margine striatus, luride alutaceus, aetate maculatus vel rimoso-areolatus, 6–7 cm. latus. *Lamellae* confertae, postice attenuato-liberae, albae, ventricosae, confertae, acie fimbriata, lamellulae numerosae subrotundatae. *Sporae* hyalinae, ellipsoideae, 7 × 5 μ. *Stipes* sursum attenuatus, cavus, albidus, subglaber, 5–6 cm. longus, deorsum 2 cm. crassus; annulus ampliatus, apicalis, persistens, supra striatus, subtus flocculosus.

Southern Nigeria. Old Calabar; on the ground in the Botanic Station, *J. H. Holland*, 48, with coloured fig.

Marasmius scandens, *Massee*.

Pileus minutissimus, circa 1 mm. latus, conchatus, albidus, resupinatus, pulverulentus, postremo striatus. *Lamellae* 3–5, angustissimae, interstitiis venosae. *Sporae* hyalinae, ellipsoideae, 4–5 × 3 μ. (Figs. 15–18.)

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Tropical Africa. Gold Coast; on branches of cacao tree, collected by Mr. A. E. Evans, Travelling Instructor; comm. *W. S. D. Tudhope.*

This fungus is not uncommon on indigenous species of *Cola*, and is supposed to have passed from the native plants to the cultivated cocoa, which suffers considerably from its presence.

The white cord-like mycelium extends along the surface of the branches, and produces at intervals the minute, resupinate pilei. Allied to *Marasmius aleurites*, Berk. & Cke.

Galera Burkillii, *Massee.*

Pileus carnoso-membranaceus, 1–1·5 cm. diametro, campanulatus, rigidulus, glaber, incarnatus, umbone versus saturatior, margine erecto acuto tenuissimo, ac majuscule striatus. *Lamellae* confertae, strictae, angustae, adnexae, ex albo ochraceae, acie dentatae. *Sporae* ellipsoideae, utrinque obtusissimae, ochraceae, 12–15 × 10–12 μ. *Stipes* farctus, aequalis, glaber, pallidus, 5–6 cm. longus, 1·5 mm. crassus.

India. Darjeeling, Sureil; on the ground, *I. H. Burkill*, 32200.

Readily distinguished amongst known species of *Galera* by the brightly coloured pileus and large spores. Allied to *Galera tener*, Fr.

Sphaeriaceae.

Xylaria Pattersonii, *Massee.*

Stromata erecta, gregaria vel sparsa; stipites glabri, atri, 1–2 cm. alti, basi mycelio atro fibroso vestiti; clavulae cylindraceo-clavulatae, apiculatae, nigrae, ruguloso-verrucosae, circiter 1 cm. longae. *Asci* cylindracei, sursum rotundati, deorsum in pedicello longiusculo attenuati, octospori. *Sporae* oblique monostichae, brunneae, ellipsoideae, ad latera subinaequilaterali-cymbiformae, 11–12 × 5–6 μ. (Figs. 6–8.)

West Indies. St. Vincent; on decayed fallen branches, *W. H. Patterson.*

Allied to *Xylaria aspera*, Massee; differing in the apiculate club, glabrous stem and larger spores.

Ophiobolus calathus, *Massee.*

Perithecia laxe gregaria, primo cortice immersa dein erumpenti-semiexserta, sphaeroideo-depressa, atro-olivacea, glaberrima, ostiolum cylindraceum longissimum gerentia. *Asci* fusoidei, deorsum breve attenuato-stipitati, 155–160 × 15–16 μ, octospori. *Sporae* cylindraceae, utrinque obtusatae, hyalinae, aseptatae, rectae vel curvulae, 72–76 × 5 μ. (Figs. 19–21.)

West Indies. Trinidad; on dead wood, *J. H. Hart.*

A fine well-marked species, allied to *Ophiobolus sarmenti*, Pass., but distinguished by the much longer ostiolum and erumpent perithecia.

Sordaria crustosa, *Massee.*

Perithecia densissime aggregato-confluentia, plagulas orbiculares 3–5 cm. longas atras efficientia, atra, glabra, contextu indistincto fuligineo opaco; ostiolo crassiusculo papillato. *Asci* cylindracei,

postice attenuato-pedicellati, octospori. *Sporae* ellipticae, atro-olivaceae, 25–28 × 14–15 μ, basi tantum appendiculo hyalino persistente 50 × 5–6 μ longo auctae. (Figs. 9–12.)

China. Szechuen; on dung of some herbivorous animal, *J. W. Brooke.*

A very distinct species, the closely crowded perithecia forming large orbicular crustose patches on dung. Allied to *Sordaria appendiculata*, Niessl., which differs in the villose perithecium, and the much shorter spore appendage.

Discomycetaceae.

Scleroderris gigaspora, *Massee.*

Ascomata gregaria, innato-superficialia, cylindraceo-turbinata vel e pressione mutua difformia, sessilia, extus sordide fusca, glabra, disco concavo 1 mm. diametro. *Asci* cylindracei, sursum obtusati, deorsum breve attenuato-stipitati, octospori, 250–280 × 22–25 μ, paraphysibus tenuibus apice ramosis hyalinis obvallati. *Sporae* vermiformes, rectae vel leniter flexuosae, multiseptatae, hyalinae, 150–160 × 7–8 μ. (Figs. 1–5.)

West Indies. Trinidad; occurring in clusters on scale insects—*Mytilaspis citricola*—on orange leaves, *J. H. Hart.*

Whether the *Scleroderris* is parasitic on the scale insects or not, can only be determined by experiments under circumstances where fungus and insect are available in a living condition, and in quantity. Allied to *Scleroderris seriata*, Rehm., and to *S. virescens*, Mass., but distinguished from both by the very much longer asci and spores, and by the habitat.

Uredinaceae.

Puccinia sclerolaenae, *Massee.*

Sori plus minusve dense gregarii, plerumque hypophylli, maculis lutescentibus insidentes, diu epidermide coriacea atque crassiuscula tecti, vix prominuli, atro-fuliginei, magnitudine ludentes. *Teleutosporae* oblongae seu ovato-subclavatae, medio parce constrictae, apice saepius plus vel minus apiculatae, pallide cinnamomeae, 40 × 30 μ; pedicello crassiusculo, 120 × 4 μ.

In iisdem soris teleutosporiferis adsunt uredosporae globosae, minutissimae, echinulatae, pallide fulvescentes, 15–18 μ diametro.

Australia. Queensland; on living leaves of *Sclerolaena biflora*, R. Br., *F. M. Bailey.*

Not closely allied to any known species. The teleutospore sori are variable in size and form, and are somewhat persistent, being protected by the coriaceous epidermis of the host.

Melanconiaceae.

Diplodia rapax, *Massee.*

Perithecia 3–7 aggregata, globosa, atra, primo tecta, dein erumpentia, rugulosa, glabra, 160–180 μ diametro, ostiolo minuto vix stromatis superficiem attingente donata. *Sporae* aerogenae, ellipticae, utrinque obtusae, medio 1-septatae, haud constrictae, opace fuligineae, 32–35 × 15–16 μ. (Figs. 13–14.)

Singapore. On living branches and roots of *Hevea brasiliensis*, Muell.-Arg., *H. N. Ridley*.

Tropical Africa. Gold Coast, Aburi; on living branches of *Hevea brasiliensis*, Muell.-Arg., *A. E. Evans*.

This fungus appears to be a true parasite on Para rubber trees. A curious and unexplained point is, that specimens were received at Kew for determination, almost at the same date, from Singapore and from the Gold Coast. It is just possible that the fungus has been conveyed along with the seed, as it is difficult to realise that the same species of fungus can have adapted itself to rubber trees in two distant countries, and within so short a period of time.

Mr. H. N. Ridley, F.R.S., has noted the occurrence of this fungus as a parasite on Para rubber cultivated in Perak (*Agric. Bull. Straits and Federated Malay States*, July, 1909).

Hendersonia microspora, *Massee*.

Perithecia dense gregaria, saepius plagulas majusculas formantia, erumpentia, globulosa, atra, ostiolo minutissimo vix papillato contextu indistincto donata. *Sporulae* elliptico-cylindraceae utrinque obtusatae, 3–5-septatae, fuligineae, 6–7 × 3·5 μ, sterigmatibus subconoideis suffultae.

West Indies. Trinidad; on dead or fading leaves of *Oncidium luridum*, Lindl., *J. H. Hart*.

Perithecia crowded and forming large patches on the leaf. Allied to *Hendersonia magnoliae*, Sacc.

Hyphomycetaceae.

Gloeosporium citri, *Massee*.

Maculae amphigenae, numerosissimae, minutae, primo fuscae dein albido-arescentes, postremo frustulatim deciduae ac folium perforatum relinquentes. *Acervuli* subcutanei, lenticulares, vix perspicui, 40–50 μ diametro. *Sporulae* cylindraceae, utrinque rotundato-clavatae, hyalinae, 14–17 × 5–6 μ, in cirrhos salmonicolores protrudentes.

West Indies. Trinidad; on fallen orange leaves, *J. H. Hart*.

This fungus occurred in abundance on orange leaves sent to Kew for the purpose of investigating a parasite attacking scale insects present on the leaves. All known species of *Gloeosporium* are parasites, and it is probable that in the present instance the *Gloeosporium* attacked the living leaves and brought about their early fall.

Septocylindrium suspectum, *Massee*.

Sporodochia amphigena, densiuscule sparsa, albida, aetate grisea, applanata, hyphae repentes, laxe ramosim intricatae, hic inde ramulos simplices erectos emittentes. *Conidia* cylindracea, 3–5-septata, breve catenulata, hyalina vel dilutissime roseo tincta, 35–45 × 5–6 μ.

West Indies. Trinidad; on the dead bodies of "Frog-hoppers" attached to leaves, twigs, &c., *F. Evans*.

This fungus is found in profusion on the bodies of dead "Frog-hoppers," and it is supposed that it occurs as a parasite, and might be utilised as a means of reducing the numbers of these destructive insects. Such a supposition, however, can only be confirmed or refuted by inoculation experiments conducted in those localities where host and supposed parasite occur in quantity.

Sterigmatocystis corolligena, *Massee.*

Hyphae steriles effusae, repentes; fertiles simplices, erectae, apice vesiculoso-inflatae, globosae. *Conidia* catenulata, basidiis verticillato-ramosis suffulta, globosa, flavida, verrucosa, 5–6 μ diametro, capitulum sulphureum formantia.

India. Manipur; growing on the corolla of a species of *Impatiens*, comm. *Sir J. D. Hooker.*

The present very interesting species was detected on the fleshy corolla of a species of *Impatiens* from Manipur, by Sir Joseph D. Hooker. In general structure and appearance it approaches most closely to *Sterigmatocystis sulphurea*, Fres., differing in the globose, warted conidia.

Hartiella, *Massee*; gen. nov.

Stroma teretiusculum, rigidum, erectum, apice capitate-conidiophorum, ex hyphis coalitis conflatum. *Conidia* in hypharum apicibus 1-septata, ellipsoidea, colorata, solitaria.

Differs from *Arthrosporium* and *Atractium* in the 1-septate conidia, and from *Symphyosira* in the conidia being solitary, and not concatenate.

Hartiella coccinea, *Massee.*

Stroma verticale, clavatum vel rarissime ramosum, coccineum, 1 mm. alt. *Conidia* ellipsoidea, 1-septata, glabra, coccinea, 7–9 × 4–5 μ.

West Indies. Trinidad; on shell of cacao pod, *J. H. Hart.*

This beautiful little fungus, when seen under a pocket-lens, suggests a sheaf of wheat. The colour throughout is bright red.

Macrosporium lanceolatum, *Massee.*

Acervuli epiphylli, nigro-olivacei, dense aggregati ac matricis superficiem totam velutino-puberulam efficientes; hyphae cylindraceae, erectae, flexuosae, deorsum atro-olivaceae, sursum sensim dilutiores, septatae, 80–120 × 7–8 μ. *Conidia* lanceolata, 5–7-septata, loculis centralibus 1–2 verticaliter septatis olivaceis, episporio crasso laevi donata, 60–70 × 14–17 μ.

Tropical Africa. Mozambique; on leaves of *Agave rigida*, Mill., *W. H. Johnson.*

A very distinct species, forming dusky-olive, minutely velvety patches on the leaves. The conidia are distinctly lanceolate, and the central cell alone is sparingly vertically septate. Allied to *Macrosporium concentricum*, Winter.

Description of Figures.

Fig. 1.—*Scleroderris gigaspora*, growing on *Mytilaspis citricola*, on an orange leaf. Nat. size.
„ 2.—Ascophores × 30.
„ 3.—Ascus containing 8 spores × 400.
„ 4.—Free spore × 400.
„ 5.—Fungus and scale insects on an orange branch. Nat. size.
„ 5*a*.—*Mytilaspis citricola*, × 20.
„ 6.—*Xylaria Pattersonii.* Ascophores. Nat. size.
„ 7.—Ascus containing spores × 400.

Fig. 8.—Free spores × 400.
„ 9.—*Sordaria crustosa*, on dung. Nat. size.
„ 10.—Perithecia × 40.
„ 11.—Ascus containing spores × 400.
„ 12.—Free spores × 400.
„ 13.—*Diplodia rapax*, on branch of *Hevea brasiliensis*. Nat. size.
„ 14.—Spores × 400.
„ 15.—*Marasmius scandens*. Nat. size.
„ 16.—Under surface of pileus × 20.
„ 17.—Upper surface of pileus × 20.
„ 18.—Spores × 400.
„ 19.—*Ophiobolus calathus*, × 100.
„ 20.—Ascus containing spores × 400.
„ 21.—Free spores × 400.

II.—FORESTRY NOTES.

W. Dallimore.

During the last week of November a tour was made through some of the wooded country in the north east of England, with the combined object of obtaining material for the Forestry Museum and observing the behaviour of various trees growing under forest conditions in different soils and at varying altitudes. The time was spent between 5 estates, viz., Raby Castle, Haydon Bridge, Alnwick Castle, Chatsworth and Wortley, whilst a visit was also paid to Rotherham, where notes were made on the condition of trees exposed to the adverse influence of smoke and other atmospheric impurities.

Before entering on a detailed description of the work done on the estates visited on this occasion, it may not be out of place to allude to certain general considerations and reflections induced by similar visits to localities in various parts of the country where trees are cultivated under forest conditions.

General condition of Plantations.—Broadly speaking, woods up to 20 years of age are found to be in good condition, but many older ones are suffering from over-thinning and over-aged trees. Owners, estate agents and foresters are enthusiastic over forestry matters, but much uphill work is necessary to counterbalance the effects of neglect and injudicious manipulation in bygone years.

Deteriorating Trees.—In many parts of the country well suited for the purpose, sentiment is allowed to interfere too much with practical forestry to admit of its being conducted on sound business principles. For instance, plantations are frequently found to be composed of trees which have arrived at, or passed, their prime, and which will never be of more value than they possess at the present moment; yet for more or less sentimental reasons these trees are allowed to remain year after year. From a practical point of view such plantations ought to be cut over by degrees, so

that after a resting period of 2 or 3 years, the land could be replanted and the next generation of trees grown. If these old trees are allowed to remain, say, for another 20 years, the timber will be worth no more at the end of that period than at the present time, and may be worth less on account of natural decay; whereas, if the value of the timber were realised and the cleared areas replanted, by the end of 20 years new plantations would be nearing the end of their unproductive stage. The eventual cost of clearing some old woods may be heavy, for there must be many trees that can be of little use except for firewood.

Undoubtedly there are many instances where plantations of old trees are essential for landscape effect, and where there are fine old park-grown specimens, whose value cannot be calculated in pounds, shillings and pence, which it would be rank vandalism to remove. These, however, are not now in question; it is to trees which are grown exclusively for timber that the present remarks are directed.

Over-thinned Woods.—Modern foresters are suffering rather severely for the sins of their forefathers, insomuch that a great number of woods, 40 to 80 years of age, have been over-thinned. Far too much head room has been allowed, with the result that the trees have developed branches at the expense of the trunks; therefore, the crop of timber over a given area is often less than half what it ought to have been. In some places an attempt is being made to rectify this by underplanting, but a long period has to elapse before the planter can see the beneficial results of his labour.

Young Woods.—By the appearance of the young woods one can appreciate the work that is being done, for in the majority of instances these are in a highly creditable condition. Young plantations generally, whether in poor or in better class ground, are making satisfactory progress and considerable care is being exercised as regards thinning and general upkeep. In some instances diseases of various kinds are apparent, but these are receiving what practical attention is possible.

The kinds of trees planted on a large scale are surprisingly few, the chief being larch, common and Japanese; Scots pine; Corsican and Austrian pine; spruce; oak; beech; birch and sycamore, with a little ash and poplar. Very little Douglas fir has been noted and no large plantation has been seen.

In most cases mixed plantations are preferred to pure woods though the latter may occasionally be noticed. The value of a little shelter is apparent in the case of young trees everywhere. A natural depression in the ground, a clump of old trees, or even a low hedge results in the trees in the vicinity being more vigorous than those which are less favoured.

Whilst inspecting various plantations the thought has occurred that a great deal of valuable experimental work might be carried on at a small expense, with the co-operation of landowners, by distributing young trees of various kinds, not at present grown for timber in Britain, which are known to produce valuable timber and would be likely to thrive. These, planted in mixed woods, in different parts of an estate, could be easily compared with trees which produce less valuable timber but are known to grow well, and in a few years'

time a decision could be arrived at as to the prospects of different trees in different neighbourhoods. This sort of thing is being done with Douglas fir on one or two estates.

Estate Nurseries.—Estate nurseries are receiving attention almost everywhere, and foresters are enthusiastic over their nursery grounds. The general conclusion is that a nursery in connection with estate forestry is a valuable asset, for, in addition to its being more economical to grow young trees rather than purchase them large enough to put out, more satisfactory results are obtained from trees grown on the place than from those received from a distance. The conclusion is possibly just, for not only are the trees grown under the same climatic conditions from babyhood, but when planting, it is only necessary to lift sufficient at one time for a single day's planting, no long railway journey is necessary and the laying in of many thousands of young trees is dispensed with. In some cases the young trees are raised from seed sown on the estate, but more frequently one year old seedlings are purchased. These are planted in nursery rows and taken to permanent positions when from 3 to 4 years of age.

Sale of Timber.—It is difficult to form anything like a correct idea of the average value of the different kinds of timber, since so much depends on quality and distance from railway or town. Occasionally a local demand occurs for some special kind of wood and a good price is obtained, whilst, only 50 miles away, little more than firewood price has been obtained for the same kind of timber. Undoubtedly, were the supply of timber regular prices would be better; as it is, fellings are often irregular, and one year the local market may be flooded, whilst for several years afterwards no timber is cut. Owing to this, there is no encouragement for timber merchants to erect plant for dealing with large quantities of timber in a particular neighbourhood, and it has to be sent a long distance to a market, a circumstance which has a decidedly adverse influence on the price. Larch usually sells well and from tenpence to one shilling and twopence a cubic foot is obtained standing. Scots pine on the other hand may fetch eightpence a cubic foot if of good quality, whilst in an out-of-the-way place it has been sold for twopence half-penny. On one estate a small plantation of black poplar about 60 years old was disposed of recently at ninepence a cubic foot after deducting cost of delivery at the local station $2\frac{1}{2}$ miles distant. Oak appears to fluctuate considerably, some being down as low as one shilling while from other plantations it is sold at double the price. As a rule timber is sold standing and the buyer sees to the cutting and removal.

Timber for estate purposes frequently forms a large item, and each estate usually runs its own saw mill and creosoting plant.

Sport and Forestry.—The rearing of game, shooting, and to some extent hunting, deserve serious consideration in connection with forestry. On most estates gamekeeping and forestry are run together, therefore the forester has to arrange his work so that there is no serious disturbance of game. This may handicap him rather considerably, for he may be precluded from work in certain woods during several of the most useful months of the year, *e.g.*, from

September until shooting parties are over, which may not be until about the end of January. Moreover, gamekeepers must have the run of the woods, and, in the event of undergrowth being scarce, branches of Scots pine and other evergreens may have to be introduced from other places and stuck in the ground. As a result of this, branches brought from disease-infected trees have sometimes started an epidemic in what was previously a clean plantation. In some cases it has been noticed that some of the poorer trees had been partly chopped through and broken over so as to lie on the ground. Such a proceeding may be advantageous from the gamekeeper's point of view ; it certainly is not so from that of the forester. The rearing of pheasants, however, causes but slight annoyance as compared with the damage done by hares and rabbits.

Hares and rabbits are responsible for considerable damage by the wholesale nibbling of the bark of young trees. Some plantations have been observed where almost every beech and oak had been nibbled, and it appears that it has been necessary to plant some woods three times over on this account. Many of the younger plantations are protected by wire netting. This, however, is an expensive item, and adds considerably to the upkeep of woodlands. The system of debiting the game department with the cost of wire netting has been introduced on some estates ; this appears to be a proper step to take, since but for the game, wire netting would not be required. Acting on strictly business principles, the game department ought to be debited with the loss caused by nibbled trees, extra labour, and introduced insect pests.

Damage caused by hunting is usually due to thoughtlessness. In the excitement of a hot chase young plantations sometimes suffer, whilst cases are known where a huntsman and his pack of hounds have quartered themselves as calmly in a two-year-old plantation as they would have done on a meadow.

Labour.—As a rule the work on an estate is carried on by regular hands. Ordinary woodmen are drawn from the neighbourhood ; head foresters and foremen from other parts of the country. A few young foresters move about from estate to estate to gain experience, and these are the men who usually obtain situations in after life as head foresters. If extra labour be required for planting, men are preferred who have led an agricultural life, that is to say, men who have small farms in the vicinity, and their sons, or agricultural labourers. The older foresters have very decided views with regard to the training of young foresters. They maintain that a sound practical training is essential but not sufficient, and that a certain amount of theoretical knowledge, with some idea of general estate management, is desirable. On this account some foresters give those under them theoretical instruction, lessons on book-keeping and other subjects, while those in the vicinity of Newcastle endeavour to get their men to take the forestry course of lectures given at the Armstrong College in that city.

Visit to Rotherham.—Nov. 24.

Rotherham is typical of towns engaged in the iron and coal industry and the atmosphere is perpetually charged with smoke and other impurities which exercise a disastrous effect on tree life. In

the immediate vicinity of collieries, coke ovens, steel works and live spoil heaps it would be difficult to imagine worse conditions, whilst half-a-mile away, circumstances are little better. Even at a distance of from one to two miles from some of these places, the enervating effects are noticeable, especially in connection with old trees, and scores of dead and dying trees are to be seen. In one case a small plantation was pointed out where quite one-third of the trees had died within the last 7 years. Young trees also suffer as may be noticed by enfeebled growth and weak buds. Horse chestnut and beech appear to be particularly hardly hit whilst conifers are impossible. The young trees which appear to stand the greatest chance are sycamore, plane, ash, elm, and sweet chestnut.

Raby Castle Estate.—Nov. 25.

Raby Castle, the Durham residence of Lord Barnard, is situated in the village of Staindrop, $2\frac{1}{4}$ miles distant from Winston Station, which is reached from Darlington. Between Winston and Staindrop the attention is drawn to the use made of the common thorn as a hedge-row tree, for that and the ash appear to be used almost exclusively for the purpose. The majority of the thorns are well developed examples with trunks 6 to 10 feet high with an average circumference of between 3 and 4 feet. On arrival at the estate office, Lord Barnard's agent, Mr. Fife, placed me under the guidance of the head forester Mr. Bewick, and I was shown as much of the home woods as the time at my disposal would allow. The woods and plantations extend over an area of about 2,200 acres and are principally situated on land of fairly good quality. They are nowhere more than a few hundred feet above sea level but in another part of the county, about Teesdale, Lord Barnard has established plantations at an altitude of between 1,000 and 1,200 feet which are said to be giving satisfactory results.

Lord Barnard is keenly interested in forestry and pays much direct attention to the work. Everything is conducted on strictly business principles, and strict accounts are kept of expenditure and income.

The trees most in evidence in old and young woods are larch, oak, beech, Scots pine (used in young woods extensively as a nurse) and birch. Ash, which is so frequently used in the neighbourhood in hedge-rows, is scarce in the woods. In one place poplar has been grown with advantage, whilst some good sweet chestnuts were noted in the park.

The older woods have been over-thinned at some period, but contain a lot of very good timber. A very nice oak plantation was noted in which the trees were from 50 to 70 feet high with a girth of from 50 to 70 inches. Good plantations were also noticed of spruce, beech, birch and a mixture of oak, larch, beech and other trees. A rotation system of felling and planting has been adopted within the last few years and from 120,000 to 130,000 young trees are planted annually. About half of these are drawn from the estate nursery aud the remainder are purchased. Plantations from one year old to fifteen were noted and, taken all through, growth was satisfactory. As a rule little growth is apparent during the

first year, but when established, leads 18 inches in length are common. Spruce appears to suffer rather badly the first year or two after being put out but eventually recovers and grows rapidly. A few Douglas fir were seen here and there. Mr. Bewick is of opinion, however, that this tree will thrive best as a pure wood.

In all new plantations corners are being left for game cover and in those corners everything will be sacrificed for the sake of cover. The rides are so arranged that they lead to these parts, so that during shooting operations, the guns may be stationed in the rides about the covers, the game being driven to those particular places. It is considered that this will be an advantage to both the woods and the game keepers.

As it is a hunting country provision has been made for keeping horsemen off the young trees by marking out the rides with stakes from 6 to 8 feet in height. One young plantation I passed through had a rank undergrowth of broom and gorse. This, I was informed, sprang up naturally after an oak wood about 200 years old had been felled and the idea is that the seed had been in the ground and lain dormant until the soil was disturbed. At any rate there is no other broom or gorse in the immediate neighbourhood. How long broom and gorse had been absent from the wood was not known.

Larch disease is rather prevalent and larch aphis is found in most of the young plantations. For this reason the proportion of larch to other trees planted has been reduced about one-half. Some of the older larch about the estate show that they have been diseased in their younger days but appear to have grown out of it now. That larch thrives in the neighbourhood is clear from the numerous fine examples to be seen. One specimen noted is about 115 feet high, with a girth of 9 feet 6 inches at 4 feet above the ground. This has been calculated to contain from 240 to 250 feet of timber and to be worth about £15. An outlying plantation, formed principally of Scots pine, was badly attacked, a few years ago, by the pine saw-fly. This has been practically cured by hand picking during the larval stage, though it took several years to accomplish.

Fine individual trees of oak, beech, spruce, silver fir and sweet chestnut were noted.

Haydon Bridge.—Nov. 26.

A visit was paid to Haydon Bridge, which is situated about midway between Newcastle and Carlisle, for the purpose of meeting Mr. E. Davidson, the Secretary of the Royal English Arboricultural Society. Mr. Davidson manages several estates in the neighbourhood and in his company I visited the woods belonging to Mr. J. E. Rogerson. The principal young woods stand in very exposed positions at an altitude of between 500 and 600 feet, and are composed mainly of Scots pine. Haydon wood was planted about 30 years ago and is about 7 acres in extent. The trees are from 40 to 45 feet high and of 10 consecutive trees the girths were 42, 31, 38, 30, 20, 32, 31, 25, 21, and 34 inches respectively. The wood has, however, been rather over-thinned and the trees

are inclined to develop too large heads. Several younger woods were visited in which Scots pine formed the dominant feature. Some of these were on poor, heather-covered land but the trees were vigorous and the past season's growths were from 12 to 18 inches in length. In the neighbourhood some very fine spruce may be seen.

Alnwick Castle Estate.—Nov. 27.

The Alnwick Castle estate of the Duke of Northumberland forms the business centre of His Grace's Northumbrian property. I there met Mr. Gillanders, the head forester, who gave me an idea of the forestry carried on in different parts of the county. Between 5,000 and 6,000 acres are given over to woodland, and upwards of a quarter-of-a-million young trees are planted annually. Eight nurseries have been established in different parts of the county, two of the principal ones being at Alnwick. These were stocked with young trees, from seedling size to those ready for permanent planting. Seedlings of many kinds are raised on the place, and good seed-beds of various kinds of seedlings were noted. Experiments are being carried on with *Pinus montana*, *P. montana uncinata*, and *Picea alba*, as shelter trees and bushes in exposed situations; it is as yet too early, however, to determine their value as compared with other species.

In the neighbourhood of Alnwick trees generally thrive well, and very fine examples were noted in the park and dairy ground of beech, Douglas fir, silver fir, elm, oak and other trees. The altitude in that particular district does not exceed 200 feet, but in other parts of the county, plantations have been formed up to 1,200 feet, with, I was told, satisfactory results. At the higher stations, and in the more out-of-the-way places, Scots pine is the principal tree grown, and as much as possible of the timber is cut up on the spot by means of a portable saw mill, whilst on the lower lands and in more accessible places, trees which produce better quality timber are planted so that they may be removed bodily by road, rail, or water, to the nearest market.

A regular system of felling and planting has been adopted, and in one direction or another, work, directly or indirectly connected with forestry, is found for a large number of men. Near the forester's house there is a very fine saw mill, which is capable of turning out an enormous quantity of work, and a capital creosoting plant, the motive power for the two being supplied by an ordinary traction engine. The creosoting tank is in the form of a long cylinder, one end of which can be removed. The bottom is fitted with rails connected with the timber yard, so that loaded trucks of material may be easily run into the tank, and as easily removed when the work is accomplished. When full, the end is placed in position and secured. The cylinder is then filled with creosote, which is heated, pressure is applied to inject the creosote and the timber is ready for removal in from 3 to 4 hours in most instances. A machine is also employed for working up small wood, branches and first thinnings from plantations, into serviceable fencing. The pieces of wood are connected by two or more rows of strong wire,

which is well twisted between each two uprights. The wood is all creosoted, and what would otherwise be valueless except for firewood, is turned into a capital, light, portable fence.

Mr. Gillanders is greatly interested in entomology, and most of his spare time is connected with this hobby. After 20 years study of forest insect life, he has lately presented the substance of his observations to foresters at large in the form of a book entitled "Forest Entomology."

The time at my disposal was too short to allow me to visit the various plantations in the neighbourhood, they are, however, composed chiefly of larch, beech, oak, Scots pine, sycamore and birch.

Chatsworth.—Nov. 29.

A great deal of planting has been done on the Derbyshire estate of the Duke of Devonshire, within the last 20 years, especially in the vicinity of Chatsworth. The land generally appears to be of poorer quality than that seen further north, yet, that it is good enough to grow good trees on is shown by the many fine specimens seen about the park, and the vigorous growth made by trees in young plantations. About the Derbyshire hills and moorlands there appears to be a wide area suitable for forest land, which, at the present time, affords but scanty pasture for sheep. In the neighbourhood all sorts of altitudes up to 1,200 feet may be found, and a fairly wide selection of trees might be grown. The district, however, is a cold one, and I am informed that frost is frequently experienced during every month of the year. Spring is a trying time for the larch about Chatsworth, and the first growth is frequently crippled by cold, yet many young plantations are making satisfactory progress. The trees planted most largely are Scots pine, oak, beech, birch, larch and spruce. Mr. Robertson, the head forester, has experimented all over the estate with Douglas fir, but in no instance has he had results which warranted his carrying on the cultivation beyond the experimental stage.

In this particular part of Derbyshire, the fields in most cases are divided by stone walls instead of hedges, and where a field has been taken over in an exposed position for plantation work, surrounded by a wall, the shelter afforded has made a wonderful difference to growth, whilst the greater proportion of vigorous hard-wood trees in such plantations, shows that they are hare and rabbit proof. The value of such walls as a fire-break was apparent in one plantation which had, through some mishap, been set on fire. The fire had worked through the whole plantation, and was only checked from spreading over a larger area by the wall. As an instance of planting on rough ground, a plantation was noted on what was apparently the site of an old quarry, and there were scarcely half-a-dozen consecutive yards of level ground in the whole area, whilst large and small stones cropped up everywhere. From this ground, however, one crop of trees has already been taken, and another crop is established. Several patches in young plantations were noticed where the root-rot fungus, *Armillaria mellea*, had carried off numerous trees. Scots pine appears to be the worst sufferer.

Mr. Robertson takes a keen interest in all that affects forestry and foresters, and in addition to giving his own men practical training, he has instituted a course of technical lectures, which are attended by his own men and by men from neighbouring estates.

Wortley Hall.—Nov. 30.

Wortley Hall, the property of Lord Wharncliffe, forms the business centre of the Wharncliffe estate, and is easily reached from Sheffield. For a distance of 3 or 4 miles the railway passes through the largest wood, known as Wharncliffe wood, 1,200 acres in extent, and it is easy to see that if woods are to be planted in the vicinity of railways, precautions will have to be taken to guard against fire, for this wood has suffered very severely, and large areas have been destroyed. The most disastrous time for fires in that neighbourhood is said to be early spring.

The woods on this estate are under the superintendence of Mr. Goldring, of Kew, and a considerable amount of planting has been done during the last 22 years. Mr. Broughton, the estate agent, took me round the majority of the younger woods, and very good plantations were seen of Japanese larch, Corsican pine, and mixed trees. A plantation of Japanese larch on the site of an old nursery is very vigorous, and another good plantation mixed with pine was seen in an exposed place at an altitude of 800 feet. In the last-named plantation, the soil is of a clayey character overlying rock 18 inches below. Young plantations, 2 to 4 years old, of mixed trees, were noted which were making remarkable progress. Previous to planting, the ground was well worked by a steam plough. Plants $1\frac{1}{2}$ feet high were inserted, and many which have been planted 4 years are now upwards of 10 feet in height. Last season's growth in numerous instances measured $2\frac{1}{2}$ feet in length. It is only fair to add, however, that the best plantations are well sheltered. In another place a larch plantation, 3 years planted, averaged between 8 and 9 feet in height.

It is estimated that 1,000,000 Corsican and Austrian pines have been planted about the estate, one large wood, known as the Jubilee plantation, being composed almost entirely of these trees. This plantation varies in altitude from 300 to 600 feet, and is on sandy loam, overlying clay. The trees averaged 4,000 to the acre at planting time, 1887, and are now about 35 feet high with an average diameter of $6\frac{1}{2}$ inches at 3 feet from the ground. An isolated tree was seen in another position which is about 50 years of age and 60 feet high. This tree, I was informed, is adding girth at the rate of $\frac{3}{4}$ of an inch a year. When these pines were first planted, it was with the idea that the thinnings could be disposed of locally for pit props, but owing to rapid growth, the wood lacks the necessary strength. For landscape effect pure woods of these pines have too sombre an aspect, and the introduction of lighter coloured foliage here and there would be an improvement. The natural tree of the neighbourhood is sycamore. This seeds freely and grows rapidly, and a local market is found for the wood. About the park there are many fine old trees, and in the pleasure grounds a fine old oak was seen which girthed 21 feet 3 inches at 4 feet from the ground.

Several colliery spoil heaps in the neighbourhood are being clothed with *Caragana arborescens*, *Colutea arborescens*, *Rosa rubrifolia*, common broom and other things, whilst in two places young plantations of the true cricket-bat willow were noted.

In conclusion, I should like to express my gratitude for the kindness shown by all with whom I came in contact during the tour.

III.—ON THE GROWTH OF ULVA LATISSIMA, L. IN WATER POLLUTED BY SEWAGE.

A. D. Cotton.

It is well-known that the marine alga *Ulva latissima*, L. thrives in brackish water and in localities where fresh water runs into the sea. At the mouths of rivers and on muddy shores of estuaries it frequently occurs in great quantities, forming a broad belt extending for several miles. Its growth under these conditions is sometimes remarkably luxuriant, fronds of enormous size being produced. In stormy weather, especially during summer and autumn, much of the *Ulva* is detached and washed ashore. This mass of vegetable matter if not taken out to sea by succeeding tides, speedily decays and gives rise to a most objectionable smell, sulphuretted hydrogen being liberated. In the neighbourhood of several seaside towns the smell amounts to a nuisance and the authorities have annually to take steps to remove the masses of decaying seaweed. Occasionally the trouble is so severe that in spite of all efforts the stench is almost intolerable. In these cases not only is the health of the population affected, but property in the vicinity is depreciated. It is not surprising therefore, that though the *Ulva* is quite unobjectionable whilst growing, enquiries should be made as to the best method for its eradication.

Although the fact that *Ulva latissima* flourishes in brackish water has long been familiar to botanists, it has only comparatively recently been shown that its occurrence in quantity is associated with the pollution of seawater by sewage. The subject has been specially investigated by Professor Letts, and his results show that in polluted water *Ulva* grows in remarkable luxuriance. That it flourishes and sometimes grows to a large size in water which though brackish is comparatively pure is not denied ; but its excessive growth in large quantities appears to be confined to sewage-polluted districts.

The decay of the *Ulva* has also been studied to some extent by Letts, but the subject requires further investigation. It is probable that at least two species of bacteria are concerned. The products of the fermentation induced by the first micro-organism are fatty acids, carbonic anhydride, and hydrogen ; and it is believed that this organism attacks the albuminoids of the seaweed. The fermenting *Ulva* is later attacked by another species with the subsequent production of ferrous sulphide and sulphuretted hydrogen. These sulphur compounds are probably produced from the sulphates of the sea-water and not from the albuminoids of the alga.

The methods for suppressing the growth of *Ulva* may be grouped under three heads. An obvious and effective method in certain localities is to reclaim the land. This, however, is not always practicable. Two other courses are open, namely :—to poison the plant by the application of chemical substances ; or, to hold its growth in check by the regulation of local conditions based on a knowledge of its ecology. The chemical treatment even when easy of application requires to be exercised with caution on account of the danger to fish. It is a subject receiving attention from chemists and need not be further alluded to here. The last of the three methods opens up a very large and interesting field of enquiry, and one which will also probably yield results of considerable service in the solution of the *Ulva* difficulty.

The magnitude of the nuisance appears to warrant a thorough study of *Ulva latissima*. This should embrace not only cultures in the laboratory and in the open with regard to its nutrition, but an investigation of its natural growth along an extended area of the coast, noting carefully the external conditions under which *Ulva* is found to flourish. The coast selected should possess a variety of physical features, and if possible mud-flats unpolluted by sewage, for the purpose of comparison with estuarine conditions.

It may be assumed that impurities in the water materially affect the marine flora at the mouth of a river. The *Ulva* problem has been investigated by Letts from this point of view, and as might be expected many interesting facts have been brought to light. Among these may be mentioned the high proportion of nitrogen in the tissues of *Ulva* grown in polluted water, and, on the part of this plant an extraordinary power to assimilate ammonia and nitrates. In addition, however, to a chemical investigation of the subject, other questions have to be taken into consideration, such as the life-history of the plant itself, the nature of the substratum, the liability to desiccation and the movements of water due either to currents or wave-action.

Kew is more immediately concerned with the botanical aspect of the question, and in order to learn further details of the life-history and biology of *Ulva* a few days were spent by the writer at Southampton and Weymouth in November. Attention was also paid to the effect of currents. The season was somewhat late for the purpose but interesting data were obtained.

Two rivers flow into Southampton Water. The Test at the north-west corner which passes through some small towns and villages ; the Itchen on the east side into which practically all the sewage-effluent of Southampton and Eastleigh is discharged, and which therefore may be regarded as being badly polluted. The peculiar double tides in the locality probably do not aid the escape of the river water. Near the town of Southampton there are at times considerable accumulations of *Ulva*, which in warm weather putrefy and emit offensive smells. The statement by one of the residents, that the white paint of boats is blackened in a night, is in accord with observations in other places and shows that the air becomes heavily charged with sulphuretted hydrogen.

At the time of the visit a strong north-east wind prevailed which, together with the spring tides, had cleared the shore of most of the

weed that had been cast up by the autumn gales. On the west side of Southampton Water opposite the town, loose floating *Ulva* was found in abundance. In certain spots a sward of *Ulva* existed which was largely composed of small plants attached to stones by a basal disk. Among these were others attached to mussels, being firmly held together and to the mussels by the byssus of the latter. On the grass above high-water line dried *Ulva* fronds were found everywhere in profusion, having been blown ashore by the wind. This part of the Test estuary appeared too wide and too exposed to conduct investigations on the effect of currents.

A comparison was made of the algal flora at the mouth of the Test (near Redbridge) with that of the Itchen, and a considerable difference was found to exist. Records of the marine flora of these two rivers kept throughout the year, and extending over several seasons would be of much interest. It would indeed be advisable for a number of rivers to be investigated in this way with a view to obtaining a knowledge of the species characteristic of purely brackish water, and those which indicate moderate or strong sewage pollution. For preliminary work such data would form a useful index to determine roughly the amount of pollution of a given stream. Much has been done on the microscopic flora of large rivers in connection with their self-purification by micro-organisms, but apparently little or nothing of a similar nature has been accomplished with the marine algae which occur at the mouths of such rivers.

Passing now to Weymouth, the flora of the Backwater of this town afforded an interesting and profitable study. The writer was much indebted to Dr. W. B. Barclay, the Medical Officer of Health, for his kindness in giving valuable local information, and in affording facilities for work. The upper part of the Backwater (usually called the Lake) receives at its northern end the Wey, a river slightly polluted by crude sewage from a few small villages. At the other end it communicates with the harbour. The whole Backwater is tidal, but the water is impounded at the harbour end by a dam. The dam is placed just below the level of high water at neap tides, so that the tide flows daily into the lake over the dam. The gate of the dam is opened at regular intervals to cleanse the lake thoroughly. *Ulva latissima* has always been present in great quantity in this sheet of water, and unpleasant odours have existed at intervals for at least 30 years. Quite recently, however, a decided increase in growth has been noted, and this appears to be correlated with an alteration in the topography of the lake. Three years ago, in connection with railway improvements, a bridge was formed across the Backwater connected on either side by stone embankments. This has had the effect of deflecting what little current existed to the middle of the lake and forming on the eastern side a bay of quiet shallow water. During the last two seasons the increase of *Ulva*-growth in this bay has been very marked, and in the opinion of several of the residents it is connected with the loss of current. If this be correct it confirms what has previously been suspected, that tranquillity of water is specially important in favouring the growth of *Ulva*. The amount of weed that is actually

attached to the bottom in the bay in question requires, however, investigation. For many years the corporation have had men at work removing the *Ulva* throughout the summer and autumn months (in 1909, June to November). The weed is collected by means of wooden rakes and is carted on to the land as manure.

In noting the ecological conditions of this lake which supports such a luxuriant *Ulva*-growth, the following are the most marked features :—(1) the feeble salinity of the water ; (2) the presence of a certain amount of sewage pollution (besides the Wey a storm-over-flow containing sewage also flows into the lake) ; (3) tranquil surroundings, breakers being entirely absent, and the water being little disturbed by currents, and ; (4) the presence in the muddy bottom of stones and mussels to which the young plants are attached. The first two factors lend themselves to experimental investigation in artificial cultures. The work could be conveniently carried out at a marine biological station, and in such laboratories pumping facilities are at hand for studying the effect of flowing *versus* stagnant water. The presence of a firm anchorage raises the question of the germination of the spores and vegetative reproduction. It is well known that almost any part torn from an *Ulva* frond will grow readily, and that fronds may be kept alive in aquaria for 2 years or longer. The length of time that the young *Ulva* plant remains attached by its own disc, and the method of propagation in these vast beds has not yet been studied in detail. Kylin remarks that he has never observed the large floating fronds in a fruiting condition. Schiller, commenting on the quantity of loose *Ulva* near Triest, states that it is always sterile.

In being able to flourish in stagnant and polluted water *Ulva latissima* is unlike other marine algae. Quiet water is usually poor in species and localities contaminated by sewage are always avoided by the algologist. Most marine algae prefer turbulent conditions, or situations where a vigorous current or tide ensures thorough aeration and constant renewal of the necessary salts.

The remarkable power possessed by *Ulva* for assimilating nitrogenous compounds, may possibly explain its excessive growth in contaminated water. The supply of oxygen, which in such water is exceedingly poor, is possibly derived from that evolved from the plant itself. The intake of ammonia and nitrates would stimulate growth and hence also the assimilation of carbon dioxide, and this in turn would be attended by a corresponding liberation of oxygen which in quiet water would not be swept away but be available for respiration by the plants. Letts has pointed out that *Ulva* may be regarded as an instrument designed by nature for the final purification of polluted sea water. Bacteria first convert the nitrogen of the albuminoids and other organic compounds into ammonia and nitrates, the *Ulva* follows absorbing these substances and using the carbon dioxide which has also been supplied in abundance by the action of micro-organisms, the final result being the oxygenation of the water. This suggests an enquiry as to why it is that other algae cannot flourish under similar conditions. Many species are very sensitive to a lack of the normal amount of sodium chloride, and it is probable that they are equally susceptible to the presence of impurities. It would be of special interest to

earn something of the effect of ammonia and nitrates on other algae, and what power they possess of absorbing these substances.

As has been shown above, the presence of a vigorous growth of green algae in polluted water must be regarded as beneficial on account of the evolution of oxygen due to the process of photo-synthesis. On the other hand, the growth of *Ulva* in the neighbourhood of towns sometimes become so excessive that the nuisance on decay is exceedingly serious. The *Ulva*-enquiry is therefore of considerable economic importance, but in addition to this it is of very great interest from a purely scientific standpoint. The questions raised concern the chemist, the bacteriologist, and the botanist, and it is only by intimate co-operation that the subject can be successfully investigated.

IV.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LV.

541. **Aconitum Forrestii**, *Stapf* [Ranunculaceae]; *A. Souliei*, Fin. et Gagn., comparabile, sed caule terete, foliis brevissime petiolatis, panicula multo majore ramis inferioribus longis ramulosis oblique erectis, pedicellis longis, galeae curvatura inferiore (marginibus) perconcava, nectarii ungue glabro, cuculla longiore, carpellis glabris, stylo longo distinctum.

Tubera ignota. *Caulis* fere 1 m. altus, a medio ramosus, erectus, strictus, teres, pilis recurvis minute pubescens et superne insuper patule hirsutus. *Folia* numerosa, in parte intermedia congesta, basalia ignota; petioli subnulli vel superiores ad 5 mm. longi; laminae inferiores et intermediae utrinque glabrae, superiores inferne ad margines et infra in nervis, summi etiam supra magis minusve hirsutae, ambitu late orbiculari-ovatae, basi subtruncatae, ad 8 cm. longae et latae, ad $\frac{3}{4}$ tripartitae, segmento intermedio rhomboideo-cuneato vel sublanceolato ad 6·5 cm. longo ad 4 cm. lato, 3-lobo lobis crenato-serratis crenis latiusculis apiculatis vel acutis, segmentis lateralibus oblique ovatis inaequaliter bilobis caeterum intermedio similibus; folia summa minora et minus vel vix divisa. *Inflorescentiae* paniculatae, laxae, ubique dense patule pilosae, ramis inferioribus longis foliatis oblique erectis ramulosis; bracteae superiores lanceolatae, utrinque dente 1–2 magno triangulari instructae, inferiores in folia abeuntes; bracteolae lanceolato-lineares vel lineares; pedicelli sub anthesi 3–4 cm. longi, demum magis elongati. *Sepala* coerulea; summum galeatum pilosum, 2 cm. altum, a basi ad apicem 1·5 cm. metiens, curvatura superiore fere semicirculari inferiore perconcava, acute rostratum rostro deflexo; sepala lateralia late suboblique obovata, circiter 1·8 cm. longa, inferiora oblique anguste oblonga, circiter 1·5 cm. longa, paulo descendentia. *Nectaria* ungue gracili superne prorsus curvato glabro 1·5 cm. longo, cuculla ovata 7 mm. longa apice obtusissima et in dorso gibbosa, labio latiusculo brevi subintegro parce pilosulo.

Filamenta circiter 9 mm. longa, ultra medium anguste alata, glabra. *Carpella* 5, oblique erecta, anguste oblonga, glabra vel subglabra, sub anthesi 4 mm. longa, stylo filiformi 3·4 mm. longo. *Fructus* maturus ignotus.

China. North-west Yunnan, *Forrest*.

542. **Aconitum stylosum**, *Stapf* [Ranunculaceae]; *A. spicato*, Stapf, imprimis formae laxae, simile, sed foliis magis dissectis, inflorescentia foliata et stylis quam carpellis sub anthesi conspicue longioribus distinctum.

Tubera imperfecta nota. *Caulis* robustus, ultra 60 cm. altus, pilis recurvis minute pubescens, inferne demum glabratus et nitidus. *Folia* infima 5–6 approximata, sub anthesi emortua, intermedia circa 6–8 dissita, longe petiolata, superiora paniculae ramos vel flores subtendentia multo brevius petiolata; petioli intermedii ad 11 cm. longi, superiores 4–1 cm. longi, illi demum glabrati, caeteri imprimis supra pubescentes: laminae praeter margines et nervos supra parce vel parcissime minuteque pubescentes, glabrae, ambitu cordato-orbiculares vel superiores cordato-ovatae, sinu lato vel (superiores) angusto, ad $\frac{14}{15}$–$\frac{11}{12}$ 3-partitae, segmento intermedio rhomboideo basi late cuneato 7–5 cm. longo 5·5–4·5 lato, lateralibus trapezoideis 6–3 cm. longis profunde inaequaliter 2-partitis omnibus profunde laciniatis laciniis dentato-lacinulatis lacinulis vel dentibus apiculatis. *Inflorescentia* erecta, ad 20 cm. longa, subpaniculata, laxiuscula, griseo-pubescens, foliata, ramis infimis 1–2 paucifloris uti pedicellis flexuoso-patulis, his 6–1 cm. longis; bracteae omnes praeter summas folia minora referentes, quam pedicelli longiores; bracteolae pedicellorum inferiorum foliosae, laciniato-dentatae, ad 2 cm. longae, superiorum lineares, integrae, 4–2 mm. longae. *Sepala* coeruleo-violacea (?); summum galeatum, subglabrum, oblique semi-orbiculare (a latere visum), 1·8–2·1 cm. altum, 1·7–2·4 cm. a basi ad apicem rostri brevis acuti metiens, 9–10 mm. latum, ungue brevi lato; lateralia ex ungue brevi lato oblique orbicularia, circiter 1·8 cm. longa, 1·4–1·5 cm. lata, intus hispida; inferiora late oblonga, 1·5 cm. longa. *Nectaria* magis minusve hispida, ungue curvato elongato-sigmatoideo ad 1·5 cm. longo, cuculla oblonga 6 mm. longa apice in dorso gibbosa, labio fere aequilongo emarginato. *Filamenta* parte alata lata 8–9 mm. longa, subito contracta, glabra. *Carpella* 5, late oblonga, laxe sericeo-tomentosa, sub anthesi 4–5 mm, longa, post anthesin subdivergentia, stylo filiformi gracili 6–7 mm. longo. *Fructus* ignotus.

China. North-west Yunnan, Cheku (Tsekou), *Th. Manberg*. There is only a fragment of the mother tuber attached to one of the specimens. From this it would appear that the tubers are fairly large. The taste is slightly sweet and is followed by a strong tingling sensation.

543. **Desmodium longipes**, *Craib* [Leguminosae-Hedysareae]; species e grege *Phyllodiorum*, a *D. pulchello*, Benth., bracteis multo majoribus, a *D. vestito*, Benth., et *D. grandi*, Kurz, foliorum petiolis brevissimis distincta.

Suffrutex 1·5 m. altus (*fide Kerr*). *Rami* florigeri flexuosi, striati, villosi, teretes, superne ramosi vel simplices, circiter 2·5 mm. diametro. *Folia* pinnatim trifoliolata, 20 cm. longa; stipulae

subulato-filiformes, 1·4 cm. longae, basi 2 mm. latae, striatae, villosae ; petiolus circiter 4 mm. longus. *Foliola* petiolulata, supra tenuiter pilosa et scabridula, subtus pilosa, chartacea, nervis cum nervulis supra conspicuis subtus prominentibus, apice acuta mucronata, basi rotundata, margine integro ciliato ; lateralia oblique ovata, circiter 3·5 cm. longa, 2·25 cm. lata, nervis lateralibus 7–8-jugis ; terminale oblongo-lanceolatum, 15–17 cm. longum, 5·5 cm. latum, nervis lateralibus 13-jugis ; stipellae filiformes, 2–4 mm. longae. *Racemi* terminales, usque ad 36 cm. longi ; bracteae foliis similes nisi foliolo terminali defecto, petiolo in aristam 1·5 cm. longam producto, et foliolis apice rotundatis vel emarginatis. *Umbellae* densae, multiflorae ; pedicelli breves, calycem vix aequantes, pubescentes. *Calyx* campanulatus, 4 mm. longus, 2·5 mm. diametro, pubescens, bilabiatim quadrifidus, dentibus tubum vix aequantibus. *Corolla* omnino glabra, vix 1 cm. longa ; vexillum obovatum, emarginatum ; alae oblongae, carinae leviter adhaerentes ; carina obtusa, alis longior, vexillum paulo superans. *Ovarium* sessile, 4-ovulatum, parce pubescens ; stylus superne glaber. *Legumina* plano-compressa, puberula nisi suturis pilosis, 1·2–2·0 cm. longa, 3·5 mm. lata, 2–4 articulata, sutura superiore fere recta, inferiore crenata, articulis subquadratis.

Indo-China. Cambodja : Angkor, *Godefroy ;* Tonkin, *Balansa*, 1252 ; Siam : Chiengmai, in mixed jungle on Doi Sootep, about 300 m., *Kerr*, 715.

544. Derris Yappii, *Craib* [Leguminosae-Dalbergieae] ; affinis *D. Korthalsianae*, Bl., sed foliolis trijugis cum impari haud approximato, et racemis foliis multo brevioribus differt.

Ramuli glabri, 5–7 mm. diametro, lenticellis valde prominentibus, cortice pallide cinereo, innovationibus parce hirsutis. *Folia* omnino glabra, 18–29 cm. longa, petiolo ad 5 cm. longo, rachi supra canaliculato ; stipulae deciduae, lineari-lanceolatae, 3 mm. longae. *Foliola* trijuga, ovata, ovato-lanceolata vel obovato-lanceolata, acuminata vel caudato-acuminata, apice obtusa vix mucronata, basi rotundata, chartacea, lateralia 7·5–10·5 cm. longa, 4–4·5 cm. lata, terminalia plerumque lateralibus distincte majora, usque ad 15·5 cm. longa et 7 cm. lata, nervis lateralibus 7–10-jugis cum nervulis supra vix subtus valde prominentibus ; petioluli circiter 5 mm. longi, glabri ; stipellae deciduae, filiformes, 3 mm. longae. *Racemi* compositi, conferti, ex axillis veteribus, foliis multo breviores, rachi rufo-hirsuto demum glabrescente ; pedicelli graciles, circiter 3 mm. longi, rufo-puberuli, apice bracteolis deciduis ornati. *Calyx* fere truncatus, rufo-puberulus, demum glabrescens, 2·5 mm. longus et fere 3 mm. diametro. *Corolla* calyce multo longior ; vexillum amplum, orbiculatum, emarginatum, 9 mm. longum, glabrum ; alae oblique oblongae, appendiculatae, carinae leviter adhaerentes, 8 mm. longae, glabrae ; carina obtusa, appendiculata, 7 mm. longa, extra apicem versus pubescens. *Stamina* medio monadelpha ; antherae uniformes. *Ovarium* sessile, circiter 5 mm. longum, pubescens, 4-ovulatum. *Stylus* parce pilosus, stigmate parvo terminali. *Fructus* ignotus.

Malay Peninsula. Kwala Arang, *Yapp*, 203.

545. **Sonerila Kerrii**, *Craib et Stapf* [Melastomaceae-Sonerileae]; affinis *S. Griffithii*, C. B. Clarke, sed foliis rosulatis, chartaceis, floribus multo majoribus differt.

Herba perennis, 4·7 cm. alta, cauli plus minusve hypogaeo perbrevi setulis brevibus vestito e rhizomate simplice vel parce-ramoso cylindrico vel irregularito tumido-incrassato orto; rhizoma 2–4 mm. diametro, usque ad 3·5 cm. longum. *Folia* subaequalia, petiolo 3–5 mm. longo, elliptico-lanceolata vel ovato-rotundata, apice obtusa vel rotundata, margine obscure serrato, usque ad 3 cm. longa, 2 cm. lata, basi subcuneata vel paulo rotundata, chartacea, supra viridia et setulis brevibus crassiusculis vestita, subtus purpurascentia et laxius quam supra vestita, nervis lateralibus utrinque 5–6 inferioribus 2–3 approximatis. *Cymae* plerumque 6-florae, longe pedunculatae, pedunculo pilis glandulosis parce ornato 2–6 cm. longo. *Alabastra* acutissima. *Calyx* anguste tubuloso-campanulatus, 8 mm. longus et fere 2 mm. diametro, parce glanduloso-pilosus, dentibus 3 brevibus late triangularibus. *Petala* 3, elliptico-oblonga, mucronata, 1 cm. longa, 4 mm. lata, glabra nisi subtus medio parce glanduloso-pilosa. *Stamina* 3; filamenta antheris aequalia, 8·5 mm. longa, circiter 1·5 mm. supra basin antherarum obtusam inserta, basi dilatata, glabra; antherae attenuatae, arcuatae. *Ovarium* 4 mm. altum, 1½ mm. diametro, apice ad 1 mm. excavatum, margine subintegro. *Stylus* glaber, 1·3 cm. longus.

Indo-China. Siam: Chiengmai, in open jungle on Doi Sootep 1350–1500 m., *Kerr*, 705.

546. **Vernonia Curtisii**, *Craib et Hutchinson* [Compositae-Vernonieae]; affinis *V. Gardneri*, Thw., sed caulibus, bracteis exterioribus, achaenis glabris et capitulis minoribus differt.

Herba 30–90 cm. alta (*fide Curtis*). *Caulis* teres, paulo sulcatus, glaber, superne ramosus. *Folia* alterna, elliptico-lanceolata, apice acuta, basi in petiolum brevissimum attenuata, 6–12·5 cm. longa, 1·5–4 cm. lata, serrata vel vix laciniato-serrata, membranacea, supra parce setulosa, subtus glabra, nervis lateralibus 7–12-jugis utrinque, subtus magis, prominulis. *Capitula* axillaria, solitaria, longe pedunculata, circiter 1 cm. diametro. *Involucri* bracteae multi-seriatae, oblongo-lanceolatae, usque ad 8 mm. longae, apice longe subulatae, herbaceo-appendiculatae, glabrae. *Receptaculum* subplanum, nudum. *Corolla* alba et caerulea (*fide Curtis*), glabra, 8 mm. longa, lobis linearibus circiter 2 mm. longis. *Antherae* fere 3 mm. longae, apice triangulares, subacutae. *Styli* rami 2 mm. longi, fere glabri. *Achaenia* valde 10-costata, 2·5 mm. longa, glabra. *Pappi* setae rigidae, usque ad 6 mm. longae, barbulatae.

Malay Peninsula. Kedah Province, on Langkawi Island, *Curtis*, 2127, 3690.

547. **Millottia depauperata**, *Stapf* [Compositae-Gnaphalinae]; a caeteris speciebus huius generis involucri phyllis tantum 4–5 latiusculis obtusis apiculatis et achenii rostro longo compresso ad angulos papilloso-pubescente distincta.

Annua; specimen unicum visum 6 cm. altum, a basi ramosum. *Folia* plus minusve congesta, linearia, acuta, basin versus attenata, ad 3 cm. longa, 1 mm. lata, juniora plus minusve lanata, deinde glabrata. *Capitula* solitaria, pedunculo primo superne lanato ad 3 cm.

longo suffulta, ad 6 mm. longa, ad 5 mm. diametro, turbinata. *Involucri* phylla 4–5, oblonga, obtusissima, minute tenuiterque mucronulata, ad 1·6 mm. lata, latissime scariosa, in vitta viridi media primo parce lanata. *Flores* 12–20, omnes hermaphroditi, receptaculo epaleaceo plano inserti, centrales steriles ut videtur. *Corolla* anguste tubulosa, superne subcampanulato-ampliata, aurea, 2 mm. longa, 4–5-dentata. *Antherae* lobi basi tenuissime lanato-caudati. *Stigmata* apiculata, infra apiculum circumcirca papillosa. *Achenium* (sub anthesi) lineare, 1 mm. longum, papillosum, in rostrum compressum latiusculum aequilongum ad angulos dense papilloso-ciliatum productum.

Collected by *J. Fraser* at Galafoot, Galashiels, Scotland, as a casual, and no doubt accidentally introduced from Australia.

548. **Gomphostemma intermedium**, *Craib* [Labiatae-Prasieae]; affinis *G. oblongo*, Wall., et *G. lucido*, Wall., a priore calycis dentibus multo brevioribus, a secunda foliis supra pilis stellatis obsitis differt.

Frutex erectus, ad 2 m. altus (*fide Kerr*); rami scabri, subtetragoni, circiter 5 mm. diametro. *Folia* elliptico-lanceolata vel oblongo-lanceolata, 10–22 cm. longa, 3·5–6·5 cm. lata, apice acuta, basi attenuata vel subrotundata, supra pilis stellatis obsita, scabridula, subtus hirsuta, nervis lateralibus circiter 6-jugis cum nervulis supra impressis subtus prominentibus, margine subintegro repando-denticulato vel rarius subcrenulato, chartacea, petiolata, petiolo 5–12 mm. longo. *Verticillastri* densi, multiflori, floribus singulis breviter pedicellatis, bracteis lanceolatis calyce multo minoribus. *Calyx* tubuloso-campanulatus, dense tomentosus, tubo circiter 10 mm. longo 2 mm. diametro, dentibus triangularibus acutis circiter 2·5 mm. longis. *Corolla* alba (*fide Kerr*), apice antice incurva, extus (lobo labii antici medio excepto) pubescens, 6 cm. longa, parte tubi cylindrica 3 cm. longa, intus glabra. *Stamina* 1·5 cm., postica 1 cm. longa; filamenta compressa, 1 mm. lata, antica parcissime pilosa, marginibus papillosis. *Ovarium* dense hirsutum. *Stylus* pilis divergentibus apicem versus ornatus, 4·5 cm. longus. *Fructus* ignotus.

Indo-China. Siam: Chiengmai, in evergreen jungle on Doi Sootep, about 730 m., *Kerr*, 733.

549. **Phyllanthodendron roseum**, *Craib et Hutchinson* [Euphorbiaceae-Phyllantheae]; a *P. mirabili*, Hemsl., foliis oblanceolatis, floribus longe pedicellatis, calyce glabro, et ovario piloso distinctum.

Frutex 3·5 m. altus (*fide Kerr*). *Ramuli* teretes, puberuli, cortice brunneo. *Folia* alterna, brevissime petiolata, oblanceolata, apice acuminata, mucronata, basi attenuata, 8–16 cm. longa, 2–5 cm. lata, subcoriacea, glabra, margine integro, nervis lateralibus 10–12-jugis utrinque, subtus magis, prominulis; stipulae ovato-lanceolatae, acutissimae, circiter 4 mm. longae, basi in appendicem bilobatam productae. *Flores* axillares, fasciculati. ♂ *Pedicelli* usque ad 1 cm. longi, gracillimi, glabri. *Calycis* segmenta 5, subaequalia, lanceolata, longe acute acuminata, 3 mm. longa, 1·5 mm. lata, 1-nervia, membranacea, glabra. *Disci* glandulae liberae, petaloideae, lineares, planae, apice truncatae vel rotundatae, 1·5 mm. longae, 0·25 mm. latae, glabrae. *Stamina* 3; filamenta in columnam 0·5 mm longam connata; antherae liberae, 0·75 mm.

longae, connectivo in appendicem lineari-subulatam 1 mm. longam glabram producto. ♀ *Pedicelli* gracillimi, usque ad 4 cm. longi. *Calycis* segmenta 6, quam mascula paulo longioria. *Disci* glandulae maris. *Ovarium* 3-loculare, late ovoideum, albo-pilosum; styli bilobati, 0·5 mm. longi, glabri, lobis obtusis glabris. *Capsula* subglobosa, rosea (*fide Kerr*), 1·5 cm. diametro, tenuiter puberula, distincte reticulata, exocarpio membranaceo, endocarpio corneo 0·5 mm. lato; semina 7–8 mm. longa, 3–3·5 mm. lata.

INDO-CHINA. Siam: Chiengmai, in evergreen jungle by a stream on Doi Sootep, about 730 m., *Kerr*, 697.

550. **Urceocharis edentata**, *C. H. Wright* [Amaryllidaceae-Amarylleae]; ab *U. Clibrani*, Mast., corona inter filamenta inappendiculata differt.

Bulbus tunicis brunneis membranaceis vestitus; collum breve, 1·3 cm diametro. *Folium* solitare, elliptico-oblongum, breviter acuminatum, basi cuneatum angulis exterioribus rotundatis, glaberrimum; costa supra canaliculata, subtus lata prominensque. *Scapus* terminalis, 20 cm. altus, 5 mm. diametro, dilute viridis, circa 4-florus; bracteae brunneae, 2·5 cm. longae, 5 mm. latae, scariosae; pedicelli 1·5 cm. longi. *Perianthium* album, prope apicem extus cremeum; tubus cylindricus, 2 cm. longus, 2 mm. diametro; limbus late campanulatus, 4·5 cm. diametro; lobi elliptici, acuti, 4 cm. longi, 1·5 cm. lati. *Stamina* exserta; filamenta basi dilatata connataque. *Ovarium* 8 mm. longum, trilobum; ovula pauca.

PERU. *Forget.*

This has been described from a plant which flowered with Messrs. Sander & Sons in July last and is probably a natural hybrid. The only other recorded hybrid between *Urceolina* and *Eucharis* is *Urceocharis Clibrani*, Mast. in Gard. Chron. 1892, xii. p. 214, fig. 36.

V.—MISCELLANEOUS NOTES.

Visitors during 1909.—3,360,221 visitors to the Royal Botanic Gardens have been recorded during the year 1909. These figures shew an increase of 397,507 over those for the year 1907, which up to the present were the largest numbers on record. During the last ten years (1899–1908), 17,861,093 persons have visited the gardens, giving an average of 1,786,109. The total number of visitors on Sundays during 1909 was 1,384,369, and on week-days 1,975,852. Sunday visitors have increased by 62,985; in this connection it is of interest to notice that until the year 1907 visitors to the gardens on Sundays had only on three occasions exceeded 700,000. The number of visitors on week-days shews an increase of 281,639 over the previously recorded maximum in 1907.

The greatest attendance on any one day was 103,895 on Whit Monday, May 31st. The smallest number on any one day was 191, on November 29th. The largest and smallest Sunday attendances were 71,584 and 492 respectively, and in the former figures a slight increase has occurred.

The detailed monthly returns are given below :—

January	46,561
February	72,898
March	57,020
April	379,372
May	545,984
June	329,335
July	348,820
August	1,016,114
September	314,462
October	139,009
November	67,046
December	43,600
	3,360,221

Additions to Gardens, 1909.—Additions to the collections of plants cultivated at Kew have been made during the year by exchanges with other gardens, private as well as public, and by purchase from nurserymen and others. Contributions of plants and seeds have been received from the following botanic gardens :—

Adelaide. 286 packets of Australian seeds.

Arnold Arboretum. Many packets of seeds and plants collected in China by Mr. E. H. Wilson.

Calcutta. Collection of seeds from the Himalaya ; tubers of *Amorphophallus campanulatus.*

Ceylon. Wardian case of orchids, including *Dendrobium MacCarthiae.*

Demerara. Wardian case of plants, including *Sapium Jenmani ;* various palm seeds.

Gold Coast. Orchids and seeds of varieties of *Elaeis guineensis.*

Mauritius. Palm seeds.

Kumaon (Government Gardens). *Lilium polyphyllum* and *L. Wallichianum.*

Montserrat. Seeds of *Pilocarpus racemosus* for distribution.

S. Nigeria. African orchids, tubers and seeds.

Penang. Wardian case of plants ; seeds.

Singapore. Wardian cases of orchids, and other plants, many new to cultivation ; seeds of *Raphia Hookeri*, *R. Ruffia*, *Psychotria fulva.*

Sierra Leone. *Acidanthera aequinoctialis ;* various orchids.

Nyasaland. Seeds of *Securidaca longipedunculata.*

Sydney. Plants of *Dendrobium falconirostre ;* seeds of Australian plants.

Exchanges were made with the Botanic Gardens of Edinburgh, Glasnevin, Cambridge and Oxford, and with most of the European gardens upon whom Kew is largely dependent for seeds of those annual herbaceous plants which fail to produce seeds at Kew.

Professor Pearson, of Cape Town, sent a collection of seeds obtained by him in German West Africa and Angola. Captain Heneage, H.M.S. Hyacinth, obtained for Kew seeds of *Phoenix*

andamanensis from the Andaman Islands. Mr. J. T. Norman, City Central Laboratory, Leadenhall Street, presented tubers of *Raphionacme utilis*. Professor W. Saunders, Ottawa, sent seeds of Canadian rice-grass (*Zizania aquatica*) for distribution. Mr. R. Tower, H.M. Minister, Mexico, presented a collection of Mexican cacti. Mrs. Epps, Upper Norwood. presented orchids and a large plant of *Theobroma Cacao*. Mr. C. F. Monro, Rhodesia, presented a collection of seeds obtained by him in that country. Mr. E. Ashworth, Wilmslow, gave a plant of *Trevoria chloris*. Dr. Perez, Puerto Orotava, Teneriffe, presented seeds of *Pinus canariensis*, *Convolvulus floridus* and other plants of the Canaries. Miss Mangles, Littleworth Cross, presented a number of large rhododendrons. From Messrs. J. Veitch & Sons, a collection of Chinese plants, named and unnamed, has been received. Messrs. F. Sander & Sons have sent a selection of plants and seeds from a collection made by them in Peru. Messrs. Bees, Ltd., Neston, sent various new Chinese primulas and other plants.

Among the plants of interest distributed from Kew during the year were the following :—

Zizania aquatica (seeds), *Pouteria suavis* (seeds and plants). *Pilocarpus racemosus* (seeds), *Securidaca longipedunculata* (seeds), *Raphionacme utilis* (seeds), *Pinus canariensis* (seeds), *Androstachys Johnsonii* (seeds), *Salix alba coerulea* (plants). Fifteen Wardian cases of economic plants were despatched to the Colonies and India. A large number of plants were distributed among botanical and educational establishments. There was an unusually large demand for seeds ripened at Kew and offered for distribution in *Bulletin*, *Appendix* I., 1909.

Of hardy trees and shrubs the most important contributions have been made by Professor Sargent of the Arnold Aboretum. In continuation of the consignments of Chinese seeds collected by Mr. Wilson, so liberally sent in 1908, some 400 further packets were received in 1909, most of them unnamed and under number only. Amongst them were 60 packets of Rhododendron seeds, all of which, with the exception of four or five packets, have germinated well. We have also to thank Professor Sargent for numerous living plants, especially for 25 lots of new Chinese Oaks. Among other things of more than usual interest are *Pterocarya Rehderi* (a new hybrid), *Betula Kenaica*, *Æsculus Bushii* and *Æ. chinensis*. This is perhaps the first introduction to Great Britain of this fine Chinese Horse Chestnut, for although many plants under the name have been grown in Europe during the last 30 years, none has been true.

Messrs. J. Veitch & Sons have sent a very fine collection of Chinese trees and shrubs, including the following rare and interesting species :—*Acer griseum* and *A. tetramerum*, *Berberis Gagnepainii* and *B. verruculosa*, *Dipelta ventricosa*, *Deutzia mollis*, *Camellia cuspidata*, *Dipteronia sinensis*, *Kolkwitzia amabilis*, *Larix Potaninii*, *Meliosma Veitchiorum*, *Neillia szechuanica*, *Syringa pinnata* and *Tilia Oliverii*. All these belong to the first batch of their

respective kinds ever raised or seen in this country, and they were supplemented by about 40 different lots of unnamed trees and shrubs, most, if not all, new to cultivation.

In exchange for other shrubs, about a score new Chinese species were obtained from the Hon. Vicary Gibbs, of Aldenham. They represented species of Wilson's collecting in China, which had either failed at Kew or of which seeds had not been received.

From Mr. A. Henry, Reader in Forestry at Cambridge, a quantity of seed of the Western Larch (*Larix occidentalis*) was received in February. These germinated in great numbers, and will enable this beautiful and interesting larch to be well represented at Kew in future years.

A large number of Himalayan seeds were received from the Calcutta Botanic Garden, and valuable contributions from M. Maurice de Vilmorin, and from the Royal Botanic Gardens of Berlin and Edinburgh have also to be acknowledged.

Waterfowl.—During the past year some interesting additions by presentation and exchange have been made to the collection of waterfowl and other birds in the Royal Botanic Gardens. They include—

A Mandarin Drake and a pair of Shoveller Ducks received in exchange through Col. C. G. Tottenham, Ballycurry, Ashford, Co. Wicklow, Ireland.

A pair of Pochards received in exchange through the Ven. Archdeacon Bevan, the Rectory, Chelsea.

A pair of Widgeon from the Zoological Society of London.

A pair of black Teal from Col. A. E. Balfour, Kneller Hall, Hounslow.

A pair of lavender-coloured Guinea fowl presented by Mrs. Orde, Nunnykirk, Morpeth.

A pair of Gadwall have also been added to the collection of British Duck on the lake.

An occurrence of interest in the spring was the hatching of a black-necked cygnet. Two eggs were laid, only one of which proved to be fertile. The young bird lived for about a fortnight, but was unable, apparently, to withstand the inclement weather about that time. A pair of storks have been reared as usual, and several Carolinas and other duck. The Tufted duck has quite established itself at Kew and breeds freely in the Gardens.

Dracontium gigas.—A fine example of this remarkable aroid may now be seen in flower in the T Range at Kew. It resembles *Amorphophallus* in having a large fleshy tuber and a single annual leaf of large dimensions, the petiole beautifully mottled and supporting a large spreading decompound leaf-blade. The inflorescence, which is developed after the leaf has withered, is a fleshy, funnel-shaped dark purple spathe, 2 feet 3 inches long, supported on a mottled peduncle, 18 inches long, and the short, thick spadix is entirely hidden by the folding of the lower part of the

spathe. The odour of the flowers is not agreeable. The plant was discovered in Nicaragua by Dr. Seemann in 1868, who sent tubers of it to Mr. W. Bull, of Chelsea, where it flowered in December, 1872, and a figure of it, under the name of *Godwinia gigas*, was published in the *Botanical Magazine*, t. 6048, where the following particulars are given :—

"In its native state the tuberous root of *Godwinia* attains a circumference of 2 feet 2 inches, and a weight of 90–92 ozs. The petiole reaches 10 feet in height, and has a metallic lustre and mottled surface resembling a snake standing erect, and bears a blade, 3 feet 8 inches long. The peduncle is shorter than the petiole, about 5 feet and a half, and the spathe alone is 2 feet long. The plant grows with great rapidity, and emits a peculiar odour. Dr. Seemann named this prodigy after Mr. George Godwin, F.R.S., the eminent architect, a gentleman of varied attainments, in especial recognition of his philanthropic efforts to spread a love of window-gardening and other pursuits amongst the humbler classes of London." The Kew plant was obtained from Mr. Bull. It flowered at Kew in 1889 and again several times since. There is a good figure of this plant in the *Gardeners' Chronicle* for Jan. 18, 1873.

W. W.

Museums.—During the year 1909 much time has necessarily been devoted to dealing with the large number of products obtained from the recent exhibitions held in London. This work is now completed, and much of the duplicate material has been distributed to other institutions. In addition, a good deal of work has been done, as in previous years, in generally improving and re-labelling permanent collections. It was found necessary to close Museum No. I. for a few weeks during the progress of painting and other repairs.

An exhibit similar to that forwarded to the Forestry section of the Bath and West and Southern Counties Show, held the previous year at Dorchester, was prepared for the annual show at Exeter in 1909, and a series of specimens was also forwarded to the Board of Agriculture and Fisheries for their exhibit at the "Imperial International Exhibition," held at Shepherds Bush.

During the year under review 145 contributors have presented a large number of miscellaneous products to the Museum, the bulk of which have already been dealt with. Of these donations special mention must be made of the bust in bronze of Charles Darwin, presented by the Bentham Trustees (*K.B.* 1909, p. 315), and a fine series of Javanese photographs presented by the Director, Department of Agriculture, Buitenzorg.

In connection with the Forestry section of the Museum, for which material is being gradually collected, many specimens have been received, consisting for the most part of unseasoned timber, which will not be available for exhibition for some time.

Fully labelled duplicates, to the number of 1,731, have been distributed during the year to 85 recipients, including the Royal Naval College, Osborne; Botany School, Cambridge; Museum

and Art Gallery, Sunderland; Municipal Museum, Stockport; Tottenham Museum; Avondale Forestry Station, Rathdrum, Co. Wicklow; &c.

From nearly 350 commercial firms, chiefly in London and Liverpool, from Colonial correspondents and scientific institutions, specimens of various products have been received for determination, and in the majority of enquiries the fullest available information has been communicated, in addition to the scientific name of the product.

The re-arrangement of a section of the Timber Museum has delayed the preparation of a new edition of the Guide. The first instalment of "The Useful Plants of Nigeria," published as *Kew Bulletin; Additional Series IX., Part I.*, by an officer of the department, has been issued. The permanent staff of the Museum has been increased by the appointment of an additional Assistant.

Presentations to Museums.—The following miscellaneous specimens have recently been received:—

His Grace the Duke of Wellington, Stratfieldsaye, Mortimer, Bucks. Examples of home-grown creosoted timber, together with specimens of ash affected with ash canker.

Right Honourable the Earl of Ducie, Tortworth Court, Gloucester. Section of wood of *Castanopsis chrysophylla*.

Sir C. T. Dyke Acland, Bart., Killerton Park, Exeter. Seven planks and five transverse sections of home-grown timber.

Miss Talbot, Margam Park, Port Talbot. Specimens of home-grown creosoted timber, together with particulars of experiments with creosote carried out on the estate.

Mr. C. Carus-Wilson, Strawberry Hill. Specimens of oak roots encircling flint stones.

Messrs. Joseph Gardner & Sons, Liverpool. Samples of wood of membrilla, white mangrove, and tulip tree.

Mr. Moss, Forest Gate. Twenty cases of mounted specimens of woods employed in the walking-stick industry.

Mr. D. Hill, Watford. Specimens of oak and beech obtained in excavating for the foundations for additions to the Watford gas works. These specimens were accompanied by a plan giving minute details as to the position in which the woods were found.

Dr. Perez, Puerto Orotava, Teneriffe. Wood specimens of *Juniperus Cedrus*, *Convolvulus floridus* and *Convolvulus scoparius*.

The President, Imperial Forest Research Institute, Dehra Dun, India. Series of photographs of forest trees, &c.

Mr. A. E. Evans, Aburi, Gold Coast. Specimens to illustrate diseases of *Hevea brasiliensis*, *Castilloa elastica*, and *Theobroma Cacao*.

Director of Agriculture, Gold Coast. Leaves, flowers and fruits of the oil palm (*Elaeis guineensis*).

Messrs. Bibby & Sons, Liverpool. "Shea-butter" seeds (*Butyrospermum Parkii*) and a sample of "Djave nuts" (*Mimusops Djave*) from West Tropical Africa.

Director, Department of Agriculture, Buitenzorg, Java. Photographs of the Botanic Garden at Buitenzorg and of scenery in Java.

Mr. T. W. Kirk, Department of Agriculture, Wellington, New Zealand. Series of samples of New Zealand hemp (*Phormium tenax*) and illustrations of the industry.

J. M. H.

Research in Jodrell Laboratory in 1909 :—

Boodle, L. A., and Hiley, W. E.—On the Vascular Structure of some Species of *Gleichenia*. (Ann. Bot., Vol. XXIII., pp. 419–432, t. 29, with three figs. in text.)

[Boodle, L. A.]—Padi. (Kew Bull., 1909, pp. 277–279.)

Greshoff, M. (the late).—Phytochemical Investigations at Kew. (Kew Bull., 1909, pp. 397–418.)

Lawson, A. A.—The Gametophytes and Embryo of *Pseudotsuga Douglasii*. (Ann. Bot., Vol. XXIII., pp. 163–180, tt, 12–14.)

Massee, G.—"Briar Scab." (The Rose Annual, 1909, p. 64.)

Massee, G.—Plant Diseases.—IX. Dry Scab of Potatoes (*Spondylocladium atrovirens*, Harz.). (Kew Bull., 1909, pp. 16–18, with figs. in text.)

[Massee, G.]—Dry Scab of Potatoes. (Journ. Board Agric., Vol. XVI., pp. 31–32.)

[Massee, G.]—Varieties of Scab in Potatoes. (Journ. Board Agric., Vol. XV., pp. 749–751, with two plates.)

Massee, G.—Injuries to Plants due to Hail and Frost. (Kew Bull., 1909, pp. 53–55, with one plate.)

Massee, G.—A *Funtumia* Disease (*Nectria funtumiae*, Massee). (Kew Bull., 1909, pp. 147–148.)

Massee, G.—Cucumber and Tomato Canker (*Mycosphaerella citrullina*, Grossenb.). (Kew Bull., 1909, pp. 292–293, with one plate.)

Massee, G.—Coffee Diseases of the New World. (Kew Bull., 1909, pp. 337–341, with figs. in text.)

Massee, G.—The Structure and Affinities of British Tuberaceae. (Ann. Bot., Vol. XXIII, pp. 243–263, t. 17.)

Massee, G.—Edible Fungi. II. The Parasol Mushroom (*Lepiota procera*). (Journ. Board Agric., Vol. XV., p. 839, with one plate.)

Massee, G.—The Greening of Potatoes. (Journ. Board Agric., Vol. XVI., pp. 177–180, with one plate.)

[Massee, G.]—Report on "Sprain" in Potato Tubers. (Journ. Board Agric., Vol. XVI., pp. 647–648.)

Sprague, T. A., and Boodle, L. A.—Kokoti (*Anopyxis ealaensis*, Sprague). (Kew Bull., 1909, pp. 309–312.)

Stapf, O., and Boodle, L. A.—*Peglera* and *Nectaropetalum*. (Kew Bull., 1909, pp. 188–191.)

Mr. C. K. Bancroft made a study of the life-history of *Cladosporium herbarum*, and investigated the brown spot disease of tomato and a disease of cacao caused by *Colletotrichum Cradwickii*.

Prof. F. de las Barras made some cultural experiments on the germination of Fern-spores.

Mr. L. A. Boodle studied the anatomy of some species of *Nectaropetalum* and other Dicotyledonous genera in relation to their affinities, and investigated a case of canker-like growths on the stem of a species of *Ribes*, and also continued some experiments with Cruciferous seedlings : see above.

Mr. J. Fraser, on behalf of Lord Avebury, was engaged in an extended study of the pollen of various plants.

Dr. P. Georgevitch finished a research on the conditions of growth of a species of *Bacterium* from a thermal spring, and began a study of certain cases of apospory and apogamy.

Dr. M. Greshoff (the late) carried out a chemical examination of a large number of plants : see above.

Prof. P. Groom made experiments relating to the transpiration and the rate of ascent of water in trees.

Dr. G. van Iterson (Junr.) began a research on laticiferous tissue and on the formation of resin and gum in plants.

Mr. A. J. Maslen continued his work on the anatomy of *Mesoxylon* (*Poroxylon*) *Sutcliffii*, a fossil plant from the Coal-Measures.

Mr. T. G. B. Osborn studied the root-tubercles of *Podocarpus* and *Dacrydium*, and the mycorrhiza contained in them.

Dr. D. H. Scott studied some fossil plants of Devonian age.

Miss E. L. Stephens made some observations on an apogamous species of *Pteris*.

L. A. B.

Pathology.—The number of reports issued during 1909 exceeded in number those issued during any previous year. Amongst diseases of potatoes a noticeable feature was the great extension of "Corky Scab," caused by *Spongospora solani*. On the other hand, "Dry Scab" due to *Spondylocladium atrovirens*, which was recorded during 1908, was not received at Kew during the past season. A series of experiments on the "greening" of potatoes were conducted, and the results published in the Journal of the Board of Agriculture, vol. xvi., p. 177, with plate. A considerable amount of time has been devoted to investigating the algae and fungi occurring in sewage and contaminated river-water, on behalf of the Royal Commission on sewage disposal. An investigation of the fungi causing discoloured spots on chilled beef from Argentina, has also been in hand during the past year.

A considerable amount of diseased material from the colonies and outside sources has been submitted to Kew during the past year, including *Diplodia cacaoicola*, Henn., the cause of a disease which is a source of serious damage to Cacao in the West Indies. This disease is also prevalent in the Island of St. Thomé, whence material has been submitted to Kew for examination by the representative of the Portuguese Government.

G. M.

Additions to the Herbarium during 1909.—During the year nearly 14,000 specimens were received as donations or exchanges, while just over 8,000 were purchased. The principal collections are enumerated below.

EUROPE. *Presented:* Hungarian plants, by Dr. A. de Degen; South France and the Pyrenees, by Mr. C. E. Salmon; "Kryptogamae Exsiccatae," Cent. xvii., by the Imperial Natural History Museum, Vienna; Crete, by Mr. A. Trevor-Battye; British Marine Algae, by Mr. A. D. Cotton.

Purchased: Fiori, Béguinot and Pampanini, "Flora Italica Exsiccata," Cent. viii.–x.; H. Sydow, "Mycotheca Germanica," Fasc. xvi.–xvii.

CHINA AND JAPAN. *Presented:* Japanese Algae collected by Prof. Yendo and Mr. H. G. Brand, through Mr. A. D. Cotton: Fokien, by Mr. S. T. Dunn; China, by Mgr H. Léveillé; photographs of Chinese plants in their natural habitats taken by Mr. G. Forrest, by the Royal Botanic Garden, Edinburgh.

Purchased: Madame L. Raoulx, Dr. Savatier's Japanese plants.

INDIA AND MALAYA. *Presented:* India, by Mr. A. Meebold and Mr. W. G. Craib; Travancore, by Mr. T. F. Bourdillon; Ceylon Fungi, by Dr. F. von Höhnel; Burma, by Mr. J. H. Lace; Sikkim, by the Royal Botanic Garden, Sibpur; Malay Peninsula, by the Royal Botanic Garden, Sibpur, the Botanic Garden, Singapore, Prof. R. H. Yapp, Mr. D. T. Gwynne-Vaughan and Mr. F. R. Long; Siam, by Dr. A. F. G. Kerr; Philippine Islands, by Mr. Elmer D. Merrill; Indo-China, by the Paris Herbarium; Java (Plantæ Junghuhnianae), by the Leiden Herbarium, (Fungi), by Dr. F. von Höhnel; British New Guinea, by Mr. F. M. Bailey; Dutch New Guinea, by the Buitenzorg Botanic Garden.

Purchased: Elmer, Philippine Islands; Hubert Winkler, South East Borneo.

AUSTRALASIA. *Presented:* Australian Algae and Fungi, by Mr. F. M. Bailey; New Zealand, by Miss L. S. Gibbs; plants used in the preparation of "Illustrations of the New Zealand Flora," by Mr. T. F. Cheeseman; Fiji, by Miss L. S. Gibbs; New Caledonia, by the Paris Herbarium.

Purchased: Max Koch, Western Australia; Savatier, Tahiti.

TROPICAL AFRICA. *Presented:* French Guinea, by Prof. H. Lecomte; Sierra Leone, by Messrs. A. H. Unwin and C. W. Smythe; Gold Coast, by Mr. J. Anderson; Lagos, by the Conservator of Forests; Northern Nigeria, by the Imperial Institute (Dr. J. M. Dalziel), Mr. B. E. B. Shaw; Southern Nigeria, by Mr. A. H. Unwin and Mr. J. L. Williams; South Abyssinia, by Dr. R. E. Drake-Brockman; British East Africa, by Mr. E. Battiscombe, Mr. W. Scoresby Routledge and Mr. M. S. Evans; Uganda, by Mr. R. Fyffe; Prof. H. H. W. Pearson, Angola, by the Sladen Trustees, Rev. F. A. Rogers; Rhodesia and Matabeleland, by Dr. S. Schönland and the Department of Agriculture, Rhodesia; Mozambique, by Mr. W. H. Johnson.

Purchased: R. Schlechter, West Africa; Kaessner, Central Africa.

Mascarene Islands. *Presented :* Madagascar, by Dr. J. Briquet and Prof. H. Jumelle ; Seychelles, Aldabra and Astove, by Dr. J. Stanley Gardiner.

South Africa. *Presented* : Miss R. Leendertz, Transvaal, by the Transvaal Museum ; Mr. J. Burtt Davy, Transvaal, by the Transvaal Department of Agriculture ; Natal, by Mr. J. Medley Wood ; Basutoland and Griqualand East, by the South African Museum : Cape Colony, by the Department of Agriculture, Cape Town, Dr. S. Schönland, Mr. E. E. Galpin and Dr. Hans Schinz ; K. Keytel, Tristan da Cunha, by the South African Museum.

Purchased : Scheffler and Rudatis ; Pegler, Transkei.

North America. *Presented:* United States, by Prof. C. S. Sargent and Mr. W. W. Eggleston ; California, by Prof. W. A. Setchell.

Purchased : Bush, United States ; Blumer, Arizona ; Collins, Phycotheca Boreali-Americana, Fasc. i.–xxxii. ; Macoun, Canadian mosses ; Baker, "Economic Plants of the World."

Mexico. *Presented :* By the Smithsonian Institution.

West Indies. *Presented* : W. Harris, Jamaica, by the New York Botanical Gardens ; Siphoneae from the Danish West Indies, by Dr. F. Börgesen ; Tobago, by Mr. W. E. Broadway.

South America. *Presented* : Brazil, by Dr. A. Usteri ; R. S. Williams, Bolivian mosses, by Sir Martin Conway ; specimens of Malvastrum and Nototriche, Mr. A. W. Hill.

Purchased: Savatier Herbarium ; Fiebrig, Paraguay.

The most important collection received during the year has been the Herbarium of the late Dr. P. A. L. Savatier, which was purchased from his daughter, Mme. L. Raoulx, and of which a detailed account was published in the *Kew Bulletin*, 1909, pp. 148–150. Another important donation is that from the Paris Herbarium, which contains over 1,100 named specimens from Indo-China and New Caledonia. Specimens of British New Guinea orchids, described by Mr. F. M. Bailey, have been received from him. Miss L. S. Gibbs has presented specimens in illustration of her paper, "A Contribution to the Montane Flora of Fiji," published in the Journal of the Linnean Society, Botany, vol. xxxix. pp. 130–212. Dr. G. B. P. Hochreutiner's new species of Madagascar plants have been received from Dr. J. Briquet. Dr. J. Stanley Gardiner has sent specimens collected on the various islands explored during the Sealark Expedition. The 32 fascicles of Collins' Phycotheca Boreali-Americana, which have been purchased, form the most important collection of North American Algae yet published. Prof. C. S. Sargent and Mr. W. W. Eggleston have presented many specimens of critical North American Crataegi.

C. H. W.

Presentations to the Library during 1908.—The names of the donors of books or pamphlets added to the library during 1908 are indicated in the supplement to the catalogue which appeared as Appendix II. of the *Kew Bulletin*, 1909, and certain of these, presented by the Bentham Trustees and Sir Frank Crisp, are

commented on at p. 133 of the *Bulletin* of the same year. Several other presentations made to the library in the course of 1908 have been selected for inclusion in the present note.

The Bentham Trustees have, in addition to other works, presented a well preserved copy of the French edition of Dodoens, *Cruydeboeck*, which was translated by Clusius and published at Antwerp in 1557, only three years after the date of the original Flemish edition, of which the library possesses a good copy. Like the original the translation is a small folio, containing numerous excellent woodcuts of plants. From the same source was received the *Canon Medicinae* of Husain Ibn 'Abd Allāh, who is perhaps better known under the name of Ibn Sīnā, or better still, under that of Avicenna. The edition presented was published at Venice in 1595, in two folio volumes, and is based on that version of Avicenna's writings which is attributed to Gerard of Cremona. The *Journal et flore des jardins*, edited by Boitard, Cels, and others, and continued as *Annales de flore et de pomone, ou journal des jardins*, in fourteen volumes, published in Paris between the years 1832 and 1845; the *Annales*, vols. i–xxxi., 1873–1906 and *Bulletin*, vols. i–xi., 1883–93, of the Société Botanique de Lyon; series 5 of Bourdier's *Icones mycologicae* and vol. iii. (2 copies) of Elwes and Henry, *Trees of Great Britain and Ireland*, are other important contributions to the library by the Bentham Trustees, who have also, as in former years, presented the issues for the year of about twenty periodical publications.

Sir J. D. Hooker has continued to present the publications of several societies or academies of which he is a member, and the library is indebted to him for eight volumes of manuscripts, chiefly by himself or by Sir W. J. Hooker. These include Sir Joseph's *Tour in the United States of America*, in 1877, Sir W. J. Hooker's *Journal of a Tour in Switzerland*, in 1814, and the diplomas granted to Sir W. J. Hooker, with correspondence relating to them.

The *Mitteilungen des Botanischen Museums der Universität Zürich* and other works prepared in the same establishment, which comprise dissertations by H. Aisslinger, F. Ebert, M. Jaeggli, G. Koestler, E. Kuhn, G. Nonweiler, K. Peters and A. Wolff, have been added to the library through the kindness of Dr. Hans Schinz; and the publications of the Department of Agriculture in the Dutch East Indies have been received from the Director. Amongst these is a set, complete except for the first part which Dr. Koorders presented himself, of the *Bijdrage tot de Kennis der Boomsoorten van Java*, by Dr. S. H. Koorders and Dr. Th. Valeton.

The Royal University of Upsala contributed a collection of about 120 pamphlets, chiefly dissertations, 56 of which are the original issues of those which were submitted by pupils of Linnaeus, and which were subsequently published in the *Amoenitates Academicae*.

To the Secretary of State for India the establishment is indebted for a complete set of the new edition in 26 volumes of *The Imperial Gazetteer of India*, *The English Factories in India*, 1622–1623, by W. Foster, the second edition of Schlich's *Manual of Forestry*, vol. v., and three copies of *The Commercial Products of India*, by Sir George Watt; to the Director of Military Operations, War

Office, for a set of the *Geographical Indices* compiled by Alexander Knox ; and to the Trustees of the British Museum for the second edition of the *Guide to Sowerby's Models of British Fungi*, by W. G. Smith, and the *Synopsis of the British Basidiomycetes*, by the same writer.

A copy of the second volume of the remarkably fine series of illustrations issued under the title of *Iconographie des essences forestières du Japon*, by H. Shirasawa, has been presented by the author, from whom the first volume, dated 1900, with a thin octavo volume of text, was received in 1902. No text accompanies the second volume.

The interesting collection of the botanical manuscripts of the late Richard Spruce, and letters addressed to him by Sir W. J. Hooker, G. Bentham and others, which were received at Kew through the kind offices of Dr. A. R. Wallace, are referred to in detail in the *Kew Bulletin*, 1908, p. 464.

There are many contributions to the library received through the kindness and liberality of their authors which prove indispensable for the efficient working of the establishment, and which, did space permit, should obtain more than the notice accorded to them by a mere catalogue entry ; but the value of the assistance afforded to Kew by these contributors and by the chiefs of the various kindred institutions in India, in our colonies, in America and other parts of the world, whose publications are regularly received, is best estimated by the excellent use made of the literature entrusted to its keeping and thereby rendered freely accessible to its large staff and its numerous visitors.

Botanical Magazine for January.—The plants figured are *Syringa Bretschneideri*, Lemoine, *Iris minuta*, Franch. et Sav., *Dipelta ventricosa*, Hemsl., *Ourisia macrophylla*, Hook., and *Eria rhodoptera*, Reichb. f.

The Syringa was introduced into Europe from Northern China between 1879 and 1883 ; it is most nearly allied to *S. Josikaea*, Jacq. The panicles of flowers—18 in. high and 12 in. across—are at their best in early June, when those of the common Lilac have faded. The plant is therefore a valuable garden shrub. *Iris minuta* is a beautiful little species from Japan with yellow flowers flecked with purple. This species is of interest owing to the formation of small tubers on the roots. *Dipelta ventricosa*, a native of Western China, owes its introduction to cultivation to the enterprise of Messrs. J. Veitch & Sons, and like *D. yunnanensis* was found by Mr. E. H. Wilson at an altitude of 8,500 ft. The flowers are red outside and whitish orange within. *Ourisia macrophylla* is a remarkably pretty plant from New Zealand, nearly allied to *O. macrocarpa*, Hook. f., and *O. robusta*, Col. The plant here figured was obtained from Messrs. Bees, Ltd., in 1907, and was kept under glass through the winter ; it flowered in a cold frame in April. This species is readily propagated by means of seed. *Eria rhodoptera* was first described by Reichenbach in 1882. The subject of the plate, which is a native of the Philippines, was received in 1904 from the Botanical Garden at Heidelberg.

It is most nearly related to *E. Dillwynii*, Hook., of the section *Hymeneria*, but is one of the most distinct of this section on account of its crimson petals and lip.

New Zealand Forest.—There is no vegetation on the globe which, whilst existing under climatic conditions not very dissimilar to those of Great Britain, yet presents so marked a contrast to its flora as that of New Zealand. This aspect has been vividly brought before us by the well-illustrated report* on the Vegetation of the Higher Waimarino District of New Zealand, recently issued by the Government. Waimarino is an elevated district some 1,100 sq. miles in extent, situated about the middle of North Island on the western side. It varies from 25 to 45 miles in diameter and is intersected by the main trunk railway. Its altitudes vary from a few hundred to over 4,000 feet above sea-level, and it appears to comprise within its limits most of the plants belonging to the central botanical province of New Zealand. This interesting report deals with the vegetation at elevations of 1,000 feet and over. At, and immediately above that level, the ground is covered with high forest largely composed of taxads, or allies of our common yew, amongst which *Podocarpus Totara*, *P. dacrydioides*, *P. spicatus* and *Dacrydium cupressinum* are the most conspicuous elements. Of *P. dacrydioides* Mr. Turner found a specimen close upon 200 feet high. At higher levels, and approximating 3,000 feet, beeches begin to prevail, especially *Nothofagus cliffortioides*. The pure forest is intersected by tracts of boggy or dry ground covered with a low vegetation composed of such typical New Zealand genera as *Celmisia*, *Aciphylla*, *Coprosma*, *Phormium*, &c. In the shady moist depths of the forest tree-ferns and their smaller allies are abundant and the illustrations give a good idea of their size and beauty. The beautiful *Todea superba*, long an inhabitant of our gardens, fills much of the forest floor.

Mr. Turner enumerates some 320 species of plants that he found in this district, of which more than two-thirds are endemic to New Zealand—a remarkable proportion. Two other characteristics of the New Zealand flora are illustrated by this report: the abundance of epiphytic vegetation, and the extraordinarily polymorphic character of many of its species.

W. J. B.

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* Report on a Botanical examination of the Higher Waimarino District by E. Phillips Turner, Inspector of Scenic Reserves, Department of Lands, Wellington, New Zealand, 1909.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1910.

VI.—THE GENUS MYXOPYRUM.

(*Oleaceae.*)

The genus *Myxopyrum* was founded by Blume to receive a plant collected in Java near Kuripan and at the foot of the mountain Salak in Java. This plant was described under the name *Myxopyrum nervosum*, Bl. in Bijdr. p. 683, and the description is transcribed by De Candolle in the Prodromus, viii., p. 290. In the Prodromus, viii., p. 301, a description of Wallich's genus *Chondrospermum* is given and placed under *Jasmineae*. This genus contains two species *C. smilacifolium* and *C.? coriaceum* founded on Wallich's catalogue numbers 2837 and 2838 respecively, and the earlier history of the genus and of *C. smilacifolium* is given by De Candolle.

Blume, in 1850, in Mus. Bot. Lugd.-Bat. i. no. 20, p. 320, united *Myxopyrum* and *Chondrospermum* and gave short descriptions of the three species *M. nervosum*, *M. smilacifolium* and *M. coriaceum* and suggested that *M. coriaceum*, Bl., a Bornean plant, might possibly be the same as *Chondrospermum ? coriaceum*, Wall., no. 2838.

In the Flora of British India, C. B. Clarke adopts Blume's genus, stating there are three species, but he unites both *Chondrospermum smilacifolium* and *C. coriaceum* (Wallich's 2837, 2838) under *Myxopyrum smilacifolium*, Bl., and apparently leaves Blume's *M. coriaceum* as a distinct species.

In a bundle of specimens of *Strychnos*, recently received for name from Dr. Beccari, some examples of *Myxopyrum* from New Guinea and from the Kei Islands, were noticed, and owing to the difficulty of assigning them to an existing or to a new species, a general examination of the genus appeared to be desirable.

For this purpose the material from the herbaria of the Rijks-Museum, Leiden, and the Rijks-Universiteit, Utrecht, has been kindly sent to Kew by the Directors of those institutions. The Wallichian specimens in the herbarium of the Linnean Society of London have also been examined. Of the two sheets in the possession of the Linnean Society, one is Wallich, 2837—the type of *Chondrospermum smilacifolium* from Chittagong—and is the *Myxopyrum smilacifolium* of Blume. The leaves on one specimen are

(15475—6*a*.) Wt. 108—471. 1375. 2/10. D & S.

broadly ovate-acute, rounded or slightly cuneate at the base and the flowers, much decayed, appear to have the corolla lobes rather longer than the tube. In the other specimen on the same sheet the leaves are elliptic-lanceolate or elliptic-ovate, acute, ovate-cuneate at the base ; the flowers have lost their corollas. In both the stems are sharply 4-angled with angular ridges and the leaves are trinerved and have the margins entire.

The other sheet, Wallich, 2838, bearing the label *Chondrospermum ? coriaceum*, Wall., from Taong Dong Avae, and referred doubtfully by Blume to his *Myxopyrum coriaceum*, proves to be a species of *Strychnos*. As far as can be determined in the absence of flowers, the large broadly ovate, triplinerved leaves with five nerves and the smooth yellow stem suggest that this specimen should probably be referred to *Strychnos Nux-vomica*. Mr. Boodle, who has kindly examined the anatomy of this specimen in the Laboratory, informs me that the vascular structure agrees with that of the genus *Strychnos* and that the subsidiary cells of the stomata shew cuticular striations similar to those shewn in *S. Nux-vomica*.

The Leiden herbarium contains the type specimen of *Myxopyrum nervosum* from Salak, Java, together with other Javanese and Sumatran specimens ; a specimen of *Myxopyrum coriaceum*, Bl., from Borneo, collected by Korthals, which appears to be the type of Blume's species and is quoted as the type by Miquel, Flor. Ned. Ind. ii., p. 550, and a specimen from New Guinea labelled *M. smilacifolium*, Bl. The latter unfortunately has neither flowers nor fruits, but in the texture and shape of its leaves it is quite distinct from the Indo-Malayan specimens of *M. smilacifolium*. Mr. Boodle informs me that the anatomical structure of this specimen shews considerable agreement with *M. smilacifolium*, Bl., but differs in several details and that it is probably a different species of (or near) the same genus. Miquel in Flor. Ned. Ind., vol. ii., p. 1081 refers to this actual specimen as follows "*Myxopyrum smilacifolium*, specimen e Novâ Guineâ Herb. L. Bat. dubium videtur, quippe foliis ellipticis vel elliptico-oblongis saepe obtusis, subintegerrimis, haud valide tri- vel subtriplinervis."

Miquel, l.c. p. 550, at the end of the short diagnosis of *M. smilacifolium* states that probably it does not differ from the preceding species *M. nervosum*, despite the marked difference in the descriptions of the flowers. In the Utrecht herbarium there are only three specimens of this genus belonging to *M. nervosum*, and *M. coriaceum* ; two of these are evidently fragments from Leiden, but there is one specimen of *M. nervosum* from Java (?), which appears to be one of Blume's specimens, a fragment of which is also at Leiden.

From an examination of the available material it appears that ten species of the genus *Myxopyrum* may now be recognised. Of three of these, material is very scanty, but an anatomical examination establishes them as species of the genus.

The geographical distribution of the genus is of interest, extending from Southern India, Sikkim and Assam, through Burma to Malaya and the Andaman Islands, and thence to Sumatra, Java, Borneo, New Guinea, the Kei Islands and the Admiralty Islands in the Bismarck Archipelago.

The two Indian species, *M. smilacifolium* and *M. serratulum*, with elongated corolla lobes, are evidently nearly related and in their floral characters show greater affinity to Beccari's plants from New Guinea and the Kei Islands than they do to the species from the Malay Peninsula, Sumatra, Java and Borneo. It is unfortunate that the Admiralty Islands specimen, which has been named *M. cordatum*, is without flowers, but from its foliage it shows considerable resemblance to *M. ovatum*, from the Kei Islands.

M. macrolobum, *M. ovatum* and *M. cordatum* appear to form a closely allied group.

The three species, *M. nervosum* from the Malay Peninsula, Sumatra and Java, *M. ellipticum* from Borneo, and *M. Horsfieldii* from Java, form a very natural alliance, and it seems probable that the imperfectly known *M. coriaceum* also belongs to this group. In these species the lobes of the corolla are very short, and the much longer tube is thick and fleshy.

For purposes of systematic arrangement, the genus can be divided into two groups on the relation of the lobes of the corolla to the corolla tube. This division, which may not be an unnatural one, is here adopted and set out in the following key.

Clavis specierum.

Corollae segmentes tubo longiores vel tubum aequantes.
  Folia trinervia, marginibus serratis vel integris.
    Foliorum marginibus integris vel superne plus minusve serratis ; corollae tubus 1 mm. longus, lobi 1·5 mm. longi
      1. *M. smilacifolium.*
    Foliorum marginibus versus apicem minute serratis ; corollae tubus 2 mm. longus, lobi 2·75 mm. longi
      2. *M. serratulum.*
  Folia triplinervia, marginibus integris.
    Corollae tubus 1·5–1·75 mm. longus, lobi 3 mm. longi ; antherae e tubo corollae aliquatenus exsertae
      3. *M. ovatum.*
    Corollae tubus 2–2·5 mm. longus, lobi 3·5–4·5 mm. longi ; antherae in tubo corollae omnino inclusae
      4. *M. macrolobum.*

Corollae segmentes tubo breviores.
  Folia trinervia, basi rotundata margine integra
    5. *M. ellipticum.*
  Folia trinervia vel paullo triplinervia, basi rotundato-cuneata, margine integra vel superne serrata.
    Corollae tubus 2 mm. longus, lobi 0·5 mm. longi
      6. *M. nervosum.*
    Corollae tubus 2·75–3 mm. longus, lobi 1·5 mm. longi
      7. *M. Horsfieldii.*

Species non satis notae.

Folia late ovata, basi cordata, 5-nervia 8. *M. cordatum.*
Folia anguste elliptica, elongata, basi cuneata, trinervia
  9. *M. coriaceum.*
Folia elliptica vel ovato-elliptica, basi cuneata vel rotundato-cuneata, triplinervia ... ... 10. *M. Zippelii.*

1. **Myxopyrum smilacifolium**, *Blume*, Mus. Bot. i. p. 320 (descr. emend.).

Folia ovato-elliptica vel anguste elongato-elliptica, 15–20 vel 18–25 cm. longa, 7–12 vel 6–8 cm. lata, subcoriacea, basi rotundata, trinervia, margine paullo inflexa, integra vel superne plus minusve serrata. *Inflorescentia* axillaris paniculata, compressa, multiflora; pedunculis pedicellisque glabris subglabrisve; bracteae ovato-lanceolatae, acutae, 3–4 mm. longae. *Flores* sessiles in cymulas congestae. *Calyx* 1 mm. longus, extra pilsosus, lobis 0·75 mm. longis ovatis subacutis. *Corollae* tubus 1 mm. longus, lobi 1·5 mm. longi, lineari vel lineari-spathulati, subcarnosi. *Stamina* filamentis brevibus prope tubum medium insertis; antherae 0·75 mm. longae, orbiculari-oblongae, e tubo corollae aliquatenus exsertae. *Ovarium* globosum, 0·5 mm. diametro; stigma minutum. *Fructus* baccatus, globosus, circiter 0·8 cm. diametro.

1.

India. Sikkim; Terai, *J. D. Hooker*; Upper Assam and Assam Plains, *Jenkins*; Assam, *Mrs. Mack*; Assam, Suddiya, *Herb. Griffith*, 3696; Chela, *Hooker and Thomson*, 2197; Cachar, Doarbund Pass and Shapore, *R. L. Keenan's Collector*; Chittagong, *Wallich*, 2837; Seetakond, *Hooker and Thomson*, 564.

Burma. Moulmain, *Lobb*.

Chondrospermum smilacifolium, Wall., Cat. No. 2837; Wight, Ill. t. 151, b. D; DC. Prodr. viii., p. 301. *Chionanthus smilacifolia*, Wall. in Roxb. Flor. Ind. i., p, 108; Roem. et Schult., Syst. Veg. Mant. i., p. 79; Spr. Syst. Veg. i., p. 35; Dietr. Spec. Plant. i., p. 242. *Ligustrum laurifolium*, Roxb., Hort. Beng., p. 3. *Myxopyrum smilacifolium*, Bl. Mus. Bot. Lugd.-Bat. i., p. 320; Kurz, For. Fl. ii., 160, and in Journ. As. Soc., 1877, pt. ii., 245; C. B. Clarke, in Hook. Fl. Brit. Ind., iii., p. 618.

Non *Chondrospermum coriaceum*, Bl., fide C. B. Clarke, l.c.

In the Journ. As. Soc. ii., p. 245, Kurz divides up the species into two varieties *α. genuinum* with the leaves more or less entire or minutely spinosely-toothed, and with elongated panicles and *β. ilicifolium* with spinose-serrate leaves and contracted panicles.

Myxopyrum smilacifolium, *Bl.*, var. **ilicifolium**, *Kurz*, in For. Flor. ii., p. 160, and in Journ. As. Soc. 1877, pt. ii., p. 245.

A typo differt in foliis angustioribus nervis et venis distinctis margine spinoso-serrato; inflorescentiis contractis circiter 5 cm. longis axillaribus rarius terminalibus pedunculis quadrangularibus.

Burma. Rather frequent in the tropical forests of Martaban and in those of the Andaman and Cocos Islands, *Kurz*, in Journ. As. Soc. l.c.; Pegu, *Kurz*, 2309 (Herb. Kew. ex herb Hort. Bot. Calc.).

This variety is apparently included with the species by Clarke in Flor. Brit. Ind. iii., p. 618.

A variable species as regards shape of leaves. In some specimens the leaves are narrowly elongate-elliptic; in others they are broadly ovate or ovate-elliptic; the panicle of fruits resembles a bunch of very small grapes. In the Flora of British India Penang

is cited as a locality for this species. This, however, appears to be an error, and probably refers to a specimen of *M. nervosum*, Bl. *cf.* King and Gamble, Materials for a Flora of the Malayan Peninsula, iv., p. 483.

The locality of the Andaman and Cocos Islands, cited by Kurz for his variety *ilicifolium*, also appears somewhat doubtful.

2. **Myxopyrum serratulum**, *A. W. Hill.*

M. smilacifolio, Bl., affinis, sed corollae tubo et lobis longioribus praecipue differt.

Frutex scandens. *Folia* obovato-elliptica vel elliptica, acuta vel sub-acuminata, 10–15 cm. longa, 3·5–6 cm. lata, basi rotundato-cuneata, margine versus apicem minute serrata, basin versus integra paullo reflexa, trinervia; petioli 0·7 mm.–1 cm. longi. *Inflorescentia* axillaris, plus minusve 3 cm. longa, paniculata, multiflora, gracilis; pedunculis pedicellisque minute pilosis, bracteis ovato-lanceolatis acutis 2–3 mm. longis. *Flores* breviter stipitati, in cymas 3-floras dispositi. *Calyx* 1–1·5 mm. longus, profunde 4-lobus, extra minute pilosus, lobis triangulari-ovatis subacutis, *Corolla* flava, tubus plus minusve 2 mm. longus, lobi lineares, obtusi, subcarnosi, erecti, 2·75 mm. longi, minute pilosi. *Stamina* 2, rarius staminodiis 2 etiam additis, filamentis brevibus in medio tubo insertis; antherae late ellipticae, apice glanduliferae, 1 mm. longae. *Ovarium* globosum; stylus parvus, bilobus. *Fructus* baccatus, obovoideus, circiter 1 cm. diametro.

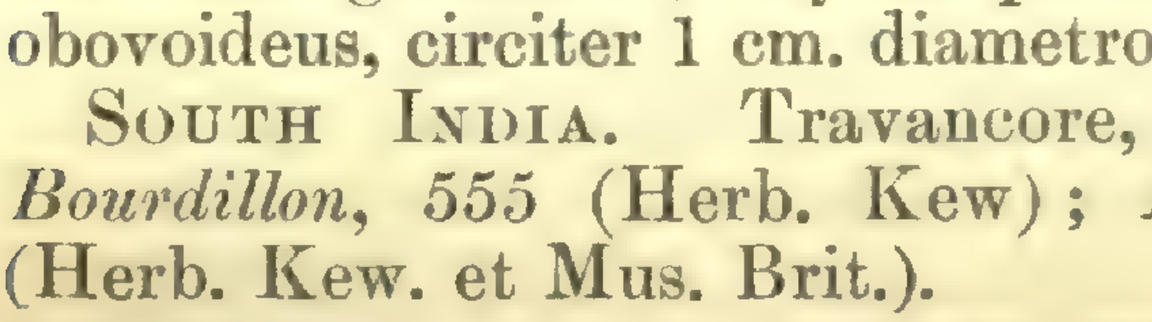
2.

South India. Travancore, Merchiston, 760 m., *T. F. Bourdillon*, 555 (Herb. Kew); Anamalai Hills, *Beddome*, 5867 (Herb. Kew. et Mus. Brit.).

3. **Myxopyrum ovatum**, *A. W. Hill.*

Species distincta in magnitudine foliis et in floribus lobis longis.

Folia ovata, acuta vel paullo cuspidata, 15–20 cm. longa, 7·5–10·5 cm. lata, basi rotundata, margine integra, supra plus minusve vernicosa, coriacea, glabra, triplinervia, 5-nervia; petioli 1·5 cm. longi. *Inflorescentia* paniculata, axillaris, densa, multiflora; pedunculi pedicellique pilosi bracteis subulatis acuminatis 1·5–2 mm. longis. *Flores* sessiles, plus minusve in cymas 3-floras dispositi. *Calyx* 1 mm. longus, extra pilosus, segmentibus triangulari-acutis 4 rarius 5, 0·5 mm. longis. *Corollae* tubus 1·5–1·75 mm. longus, lobi 4 rarius 5, plus minusve 3 mm. longi, lineares, sub-carnosi, repandi vel reflexi superne pilosi. *Stamina* 2, rarius 3, filamentis brevissimis in medio tubo insertis; antherae plus minusve ovatae, 1·25 mm. longae, apice minute glanduliferae, e tubo corollae aliquatenus exsertae. *Ovarium* ovoideum, 0·5 mm. altum; stylus bilobus, 0·25 mm. longus. *Fructus* ignotus.



3.

Kei Islands. Kei Ketteil a Tual, *Beccari* (VIII., 1873). (Erb. Coll. Beccari, 6658).

4. **Myxopyrum macrolobum**, *A. W. Hill.*

A *M. ovato*, A. W. Hill, floribus majoribus, antheris in tubo corollae omnino inclusis differt.

Folia ovata, acuta vel subacuta, 13–17 cm. longa, 6·5–9·5 cm. lata, basi rotundata, margine integra, supra paullo vernicosa, subcoriacea, glabra, triplinervia, obscure 5-nervia; petioli 1 cm. longi. *Inflorescentia* paniculata, axillaris, laxa, multiflora, pedunculi pedicellique praecipue pilosi, bracteis paucis 1·5–2 mm. longis subulatis acutis. *Flores* sessiles, in cymas 3-floras dispositi. *Calyx* 1–1·5 mm. longus, extra pilosus, segmentibus 4 rarius 5, 0·5–0·75 mm. longis triangulari-acutis. *Corollae* tubus 2–2·5 mm. longus, lobi 4 rarius 5, 3·5–4·5 mm. longi, lineares, sub-carnosi, subacuti vel obtusi, erecti vel repandi, superne pilosi. *Stamina* 2 rarius 3, filamentis brevissimis in tubo paullo infra medium insertis; antherae ovatae, 1–1·25 mm. longae, in tubo corollae omnino inclusae. *Ovarium* ovoideum, 0·5–0·75 mm. altum; stylus bilobus, 0·2–0·25 mm. longus. *Fructus* ignotus.

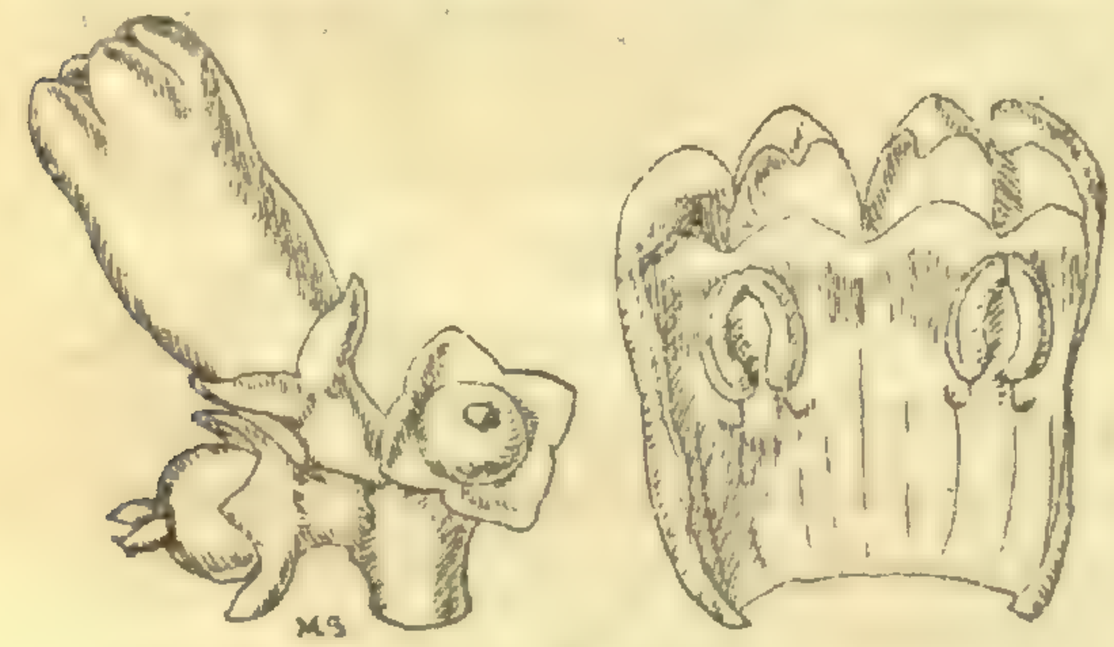
4.

New Guinea. Monte Arfak a Putat, *Beccari*, 942; (Erb. Coll. Beccari, 6657, 6657A.)

5. **Myxopyrum ellipticum**, *A. W. Hill.*

M. nervoso, Blume, affinis, sed foliis ellipticis coriaceis tubo corolla longiore et lobis brevioribus differt.

Folia elliptica, acuta, coriacea, 7·5–11·5 cm. longa, 3·5–5 cm. lata, margine integra, reflexa, trinervia, basi rotundata; petioli circiter 5 mm. longi. *Inflorescentia* axillaris, paniculata, laxa, multiflora; pedunculis pedicellisque glabris subglabrisve; bracteae triangulari-ovatae, acutae, 1·5 mm. longae. *Flores* breviter stipitati, in cymulas 3-floras dispositi. *Calyx* profunde 4-lobus, lobi 0·5–0·75 mm. longi, orbiculari-ovati, acuti, glabri. *Corolla* pallide viridis; tubus 4 mm. longus, obovoideus ad faucem ob annulum carnosum contractus; lobi 0·5 mm. longi, ovati, acuti, incurvi. *Stamina* filamentis brevissimis in tubo 1·5 mm. supra basin insertis; antherae ovato-cordatae, 1·25 mm. longae. *Ovarium* globosum, 0·5–0·75 mm. diametro; stigmatis lobi ovati, acuti. *Fructus* ignotus.



5.

Borneo. Kuching, *Haviland*, 3039.

Allied to *M. nervosum*, but readily distinguished by the stout, elliptic leaves and by the long tube and short lobes of the corolla.

6. **Myxopyrum nervosum**, *Blume*, Bijdr. p. 683; DC., Prodr. viii., p. 290; Bl. Mus. Bot. Lugd.-Bat. i. no. 20, p. 320, t. 51; C. B. Clarke in Hook., Fl. Brit. Ind. iii., p. 618; King and Gamble, Mat. Fl. Mal. Pen., iv., p. 272, (descr. emend.).

Folia elliptica, 13–18 cm. longa, 6–9 cm. lata, vel ovato-elliptica, 10–17 cm. longa, 6–10 cm. lata, acuta vel subacuta, basi rotundata vel subcuneata, margine integro vel inferne integro superne dentato

vel serrato, trinervia vel paullo triplinervia, coriacea. *Inflorescentiae* axillares, paniculatae, multiflorae, laxae ; pedicelli pilosi ; bracteae subulatae, acutae. *Flores* sessiles, in cymulas 3-floras dispositi. *Calyx* 1 mm. longus, extra pilosus, segmentibus triangulari-acutis. *Corollae* tubus 2 mm. longus, subcarnosus ; lobi 0·5 mm. longi, triangulari-ovati, acuti, apice incurvi. *Stamina* filamentis brevissimis in medio tubo insertis ; antherae 1 mm. longae, 0·75 mm. latae, cordatae, in tubo corollae omnino inclusae. *Ovarium* ovoideum, stigmatis lobi ovati, acuti. *Fructus* baccatus, globosus, 1·8–2 cm. diametro, glaber.

Malaya. Batu Togeh, 100 m., *L. Wray, Jr.*, 4179 (Herb. Mus. Perak) ; without precise locality, *Maingay*, 427 ; Malacca, *Maingay*, 1475 ; Prince of Wales Island, no collector's name (Herb. Kew.).

Sumatra. Without precise locality or collector (Herb. Ludg.-Bat.).

Java. Salak, *Blume* ; Divena, *Herb. Dr. Blume*, 791 ; Bantar djatii, *Boerlage* (with fruits) (Herb. Ludg.-Bat.) ; without precise locality, *Zollinger*, 690 (Herb. Kew. et Mus. Brit.).

On the sheet of the Sumatran specimens at Leiden there appear to be two distinct species ; the smaller of these, bearing an inflorescence, is without doubt *M. nervosum*, the leaves being ovate-elliptical with a dentate margin in the upper portion.

The other specimens have more or less obovate-elliptic leaves acuminate-cuspidate, with cuneate base and entire margins, trinerved, the nerves running into the base of the leaf in a very definitely cuneate manner. In texture the leaves of this plant are less coriaceous than those of *M. nervosum* and are similar in this respect to the doubtful species from New Guinea, referred to *M. smilacifolium*, Herb. Zipp. in the Leiden Herbarium, to which the name *M. Zippelii* has been given (p. 44).

King and Gamble *l.c.* cite localities for *M. nervosum*, Bl., in Penang, Perak, Malacca and Sumatra.

7. **Myxopyrum Horsfieldii**, *A. W. Hill.*

M. nervoso, Bl., affinis, foliis minoribus triplinervis floribus et antheris majoribus differt.

Folia obovata vel obovato-elliptica, acuta, 8–13 cm. longa, 3·5–6 cm. lata, plus minusve triplinervia, basi rotundato-cuneata, membranaceo-coriacea, margine integra vel superne obscure serrata. *Inflorescentia* axillaris, paniculata, laxa, multiflora ; pedunculi elongati et pedicelli minute pilosi ; bracteae subulatae vel lanceolatae, acutae, circiter 3 mm. longae. *Flores* sessiles, in cymulas 3-floras dispositi. *Calyx* profunde 4-lobus, extra pilosus, lobis triangulari-ovatis acutis 1 mm. longis. *Corollae* tubus 2·75-3 mm. longus ; lobi ovato-elliptici, subacuti, apice incurvi, 1·5 mm. longi, subcarnosi. *Stamina* filamentis brevissimis infra medium tubum inserta ; antherae 1·5 longae, cordatae, in tubo omnino inclusae. *Ovarium* globosum, circiter 1 mm. diametro : stigmatis lobi ovati.

7.

Java. *Herb. T. Horsfield*, M.D. (Herb. Kew. et Mus. Brit.).

This species is closely allied to *M. nervosum*, Bl., but differs in its smaller, more delicate and triplinerved leaves and in the larger flowers with longer corolla lobes and larger anthers.

8. **Myxopyrum cordatum**, *A. W. Hill.*

Folia late ovata, acuta, membranaceo-coriacea, 13–15 cm. longa vel longiora, 7–10 cm. lata, basi cordata vel subcordata, e basi 5-nervia. *Inflorescentia* axillaris, paniculata, bene evoluta. *Flores* ignoti. *Fructus* baccatus, globosus, planus, 0·8 mm.–1 cm. diametro.

M. smilacifolium, C. B. Clarke in Hook. Fl. Brit. Ind. iii., p. 618, partim ; non Blume.

Admiralty Islands. Bismarck Archipelago, Challenger Expedition, *Moseley* (Herb. Kew.).

A species easily distinguished from *M. smilacifolium*, under which it was formerly placed, by its 5-nerved, ovate-cordate leaves, though the small smooth fruits resemble those of *M. smilacifolium*. It comes nearest perhaps to *M. ovatum*, A. W. Hill, but can be easily separated from that species by the character of the leaf venation.

9. **Myxopyrum coriaceum**, *Blume*, in Mus. Bot. Ludg.-Bat. no. 20, p. 320 (descr. emend.).

Folia anguste elliptica, elongata, acuta, 14–18 cm. longa, 4·5–7·5 cm. lata, trinervia, basi cuneata, coriacea, margine integro ; petioli 1–1·5 cm. longi. *Inflorescentia* paniculata, pauciflora, pedicellis glabris vel subglabris. *Flores* breviter stipitati. *Calyx* 1·5–2 mm. longus, glaber, vel parce pilosus, segmentibus triangulari-ovatis acutis plus minusve 1 mm. longis. *Corolla* ignota. *Ovarium* ovoideum. *Fructus* baccatus, obovato-orbicularis, 1·3 cm. longus, 1·1 cm. latus, glaber.

Borneo. *Korthals* (Herb. Ludg.-Bat., Leiden).

10. **Myxopyrum smilacifolium**, Herb. Zipp. in Herb. Lugd.-Bat., No. 908, 161–792, non Blume.

Folia elliptica vel irregulariter ovato-elliptica, basi cuneata vel rotundato-cuneata, apice emarginata, paullo triplinervia, sub-coriacea, 8–10·5 cm. longa, 4–5 cm. lata ; petioli plus minusve 1·5 cm. longi. *Inflorescentia* ignota. *Fructus* ignotus.

New Guinea. *Zippel.*

This specimen was examined by Mr. Boodle who found that its anatomical structure shews considerable agreement with that of *M. smilacifolium*, Bl. (Cachar *Keenan's* Coll.), but differs in several details. It is probably a different species of (or near) the same genus.

The plant undoubtedly belongs to an undescribed species, and on account of its distinct character it is proposed to call it *Myxopyrum Zippelii*, A. W. Hill.

Species excludenda.

Chondrospermum (?) coriaceum, Wall. Cat., 2838, DC. Prodr. viii., p. 301 ; an eadem ac *Strychnos Nux-vomica* ?

Myxopyrum smilacifolium, C. B. Clarke in Hook. Flor. Brit. Ind. iii., p. 618 partim ; non Blume.

A. W. Hill.

VII.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

II. Chinese Rubi.

One of the most noteworthy particulars about the new plants now being introduced from Central and Western China is the number and distinctness of the new species of *Rubus* amongst them. Mr. Wilson has introduced about 40 new species, and of these a large proportion represent the genus in aspects never before shown in gardens. Mr. A. Henry writing of his travels in Western China (*Garden*, Jan. 4, 1902, p. 3), observes that "each new valley and range yields some new species. When on the march I always reckoned on meeting a different species of *Rubus* each 10 miles of travel, and was never disappointed."

It would, of course, be premature to adjudge the value of many of these new brambles and raspberries in our gardens. As cultivators well know, the appearance and behaviour of plants in a wild state afford very unreliable evidence of their value under cultivation. In one respect—that of flower-beauty—these Chinese species appear to be inferior to the best American ones. Not one of the following, so far as can at present be judged, will stand comparison with such species as *R. deliciosus*, *R. odoratus* or *R. nutkanus*. But as regards beauty of foliage and stem, they certainly add new and distinct types to our gardens. Mr. Henry observes that many of these brambles in a wild state have exquisitely flavoured fruits, and whilst it is improbable that any of them will give fruit equal to our cultivated forms of raspberry and blackberry, it is not unlikely that they would, by hybridising, introduce new shapes and flavours.

To accommodate these new Chinese species at Kew a border has been made in the collection of *Rosaceae*, near the Pagoda, and the following species, as well as about 20 others, were planted there last autumn and will be available for inspection during the coming summer.

I have to thank Mr. Wilson for supplying information with regard to the habitats, the colours of the flowers, and the fruits of the following species, much of which has not been published before.

Rubus chroösepalus, *Focke*; Hooker's Icones Plantarum, t. 1952.

This species, which was first discovered by Mr. A. Henry in Hupeh, is a large straggling bush with terete, glabrous stems, armed with decurved spines. Its leaves are simple and bear a very strong resemblance to those of *Tilia argentea* (well known among limes for their silvery white under-surface), cordate, as much as 7 inches long by 4 inches wide, sharply dentate, cuspidate, glabrous above, the lower surface white with a very close tomentum; petioles glabrous, 1 to $2\frac{1}{2}$ inches long, usually furnished with one or two decurved prickles. The flowers are borne in a terminal panicle, 6 to 9 inches long, each flower $\frac{1}{2}$ inch across, without petals.

Mr. Wilson informs us that the fruits are black, small, ripe in September, but of poor flavour. He collected seed, for Harvard University, near Ichang, where this species grows up to 4000 feet. Some of the seed was given to Kew in January, 1908, and the young plants so obtained proved quite hardy last winter.

The large Tilia-like leaves of this *Rubus* with their white under-surfaces make it a distinct and striking species.

Rubus corchorifolius, *Linn. f.*

Although described by the younger Linnæus in 1781, this raspberry appears never to have been brought into cultivation until Mr. Wilson introduced it from Central and Western China, where he found it at altitudes of about 7500 feet, inhabiting open thickets.

It is a shrub of erect habit, vigorous plants in their second year making stems 6 feet high, which are terete, covered with fine down and armed with straight prickles up to ½ inch in length. The leaves are dull green, simple, ovate-cordate in main outline, but usually 3-lobed on the barren stems, acuminate, up to 7 inches in length, half to two-thirds as wide, coarsely toothed, finely pubescent beneath, and furnished with hooked prickles on the petiole and midrib. The flowers are white, solitary, and borne on short lateral twigs. Fruit bright red, large, and described by the collector as having "a delicious vinous flavour" and ripe in May and June.

The Kew plants were raised from seed received at the end of 1907 from Harvard University.

Rubus coreanus, *Miquel.*

The most attractive features of this species are its erect, stout stems covered with a beautiful blue-white bloom, and its lustrous, handsomely-cut, pinnate leaves. It is a valuable addition to brambles with blue-white stems.

The plants at Kew, which passed through the winter of 1908—9 quite unaffected by cold, were raised from seed, presented late in 1907 by Harvard University, which had been collected by Mr. Wilson in Central and Western China.

During the summer of 1909, their second season, these plants produced stems 8 feet high, erect, with arching branches, and armed with stout spines up to ½ inch in length, not hooked. The leaves are pinnate, composed usually of seven leaflets, the lateral ones of which are ovate or broadly elliptic and from 1½ to 3 inches long, cuneate at the base, sessile, coarsely serrate except towards the base; when young there are silky hairs on the parallel veins of both surfaces. The terminal leaflet is much larger and broader, often 3-lobed, and truncate or subcordate at the base. The common petiole is armed with hooked prickles.

This *Rubus* is evidently a vigorous, hardy species. Mr. Wilson found it at elevations of 6000 feet and says its fruits vary in colour from red to black, are ripe in July, but small and worthless.

R. hupehensis, *Oliver*; Hooker's Icones Plantarum, t. 1816.
(*R. Swinhoei*, Hance according to Focke in Bibl. Bot. 72, p. 43.)

This is a prostrate species with dark, terete stems covered thinly when young with a grey flocculence, and armed with very short decurved prickles. The leaves are simple, oblong-lanceolate, and from 3 to 4½ inches long by about 1½ inches wide, with acuminate tips, and a rounded base; the lower surface is covered with a pale grey tomentum, the margins are serrate, and the petiole about ¼ inch long. The flowers have not yet been seen in this country but they do not appear to be in any way attractive. The inflorescence is a short terminal raceme carrying in a wild state three to seven

flowers, the calyx being covered with grey tomentum like the under surface of the leaves, and the petals falling very quickly or being altogether absent.

Originally discovered by Mr. Henry in Hupeh, this *Rubus* was first collected by Wilson, in 1907, for Harvard University. Seeds presented by that institution to Kew early in 1908, produced plants which lived outside without protection through the following winter.

The species is worth growing for its distinct and ornamental foliage which resembles that of none other in cultivation.

Rubus irenaeus, *Focke.*

A low shrub with slender, creeping stems, which are covered with a thick greyish down, interspersed with very small, recurved prickles. The leaves are roundish, up to 6 inches or more in diameter, with a wide cordate base ; the margins are ciliate, sometimes obscurely lobed, always finely dentate ; the upper surface is glabrous and green, with a peculiar metallic lustre ; the lower surface covered with a pale brown tomentum, and more or less hairy on the yellowish prominent veins. Mr. Wilson describes the flowers as white and the fruits as large and red.

This interesting and distinct species, the contours of whose leaf suggest a small *Tussilago*, was discovered by Mr. Henry in Western China, where, according to Wilson, it is common in woods at elevations of from 4000 to 8000 feet. Seeds were presented to Kew early in 1908 by Harvard University and the young plants raised from them passed unharmed the winter of 1908—9. The species would appear to be nearly or quite evergreen, for at the time of writing (early February) our plants, although transplanted in autumn, still retain their leaves.

The species promises to make a handsome low covering for the ground and will probably thrive in semi-shaded spots.

Rubus omeiensis, *Rolfe* in K.B. 1909, p. 259.

A large straggling shrub with round, pubescent, unarmed, slender stems. The leaves are simple, five- or obscurely seven-lobed, irregularly or doubly toothed, dull green above, greyish beneath and slightly downy on both sides, 3 to 7 inches long and wide ; the petioles pubescent and $1\frac{1}{2}$ to 3 inches long. The purplish flowers appear in many-flowered terminal panicles, and are followed by black fruits which Mr. Wilson informs us are of good size and flavour. The calyx and pedicels are densely pubescent.

This *Rubus* was found by Wilson on Mount Omei, and was introduced by him for Messrs. Veitch, who flowered it in August, 1908. Seeds obtained for Kew from Harvard University germinated in the spring of 1909.

It is a common plant in Western Szechuen up to 6000 feet, and ought to prove very hardy in the British Isles.

Rubus Parkerii, *Hance.*

A distinct species of scandent habit, with slender, terete, dark brown stems, armed with scattered, short, decurved spines, and covered by a dense greyish pubescence. The leaves are simple, broadly lanceolate, or obscurely 3-lobed, 4 to 7 inches long, 2 to 3 inches wide, with a cordate base and a long-pointed apex. The lower surface is covered with reddish-brown, velvety pubescence ;

the upper one, especially on the veins, with similarly-coloured short hairs. The margins are dentate and ciliate; the petiole about 1 inch long, bearing a few decurved prickles, and covered with hairs, some of which are tipped with black glands. The flowers are borne in an elongated lax panicle, the calyx being covered with red, glandular hairs. The fruit is black, and ripens in June.

Mr. E. H. Parker, after whom this species is named, first collected it in Szechuen in 1881. Seeds collected near Ichang in 1907 by Wilson, were presented to Kew by Harvard University, and plants raised from them have stood the last two winters quite uninjured.

This *Rubus* has distinct and striking foliage, and promises to make an elegant climber.

Rubus Playfairii, *Hemsley*.

A rambling shrub with very slender, whip-like, dark-green stems, covered when young with a cobweb-like down and bearing small decurved spines $\frac{1}{16}$th to $\frac{1}{12}$th inch long. The leaves are composed of three to five leaflets; the normal number appears to be five but the lower leaves on the stem have three or four leaflets only. The leaflets are lanceolate to linear-lanceolate, serrate, the terminal one the largest, up to 6 inches in length and shortly stalked; lateral leaflets sessile or very shortly stalked. In some of the ternate leaves, the terminal leaflet is large and broad and the lateral ones unequally bilobed. They are all bright-green above, with a very close, pale grey felt beneath. The curious stipules are $\frac{1}{2}$ inch long, very deeply laciniated. The flowers have little or no beauty, being $\frac{1}{2}$ inch in diameter, the calyx tomentose, with short acuminate lobes. The fruit is black, ripening in August and is said by one collector to be excellent.

Whilst this *Rubus* may have little to recommend it in its flowers or fruit, it is very graceful in habit and very distinct and handsome in foliage.

Rubus polytrichus, *Franchet*.

A dwarf shrub with prostrate stems, inhabiting woodland and remarkably distinct from any other *Rubus* in cultivation. The stems are terete, quite devoid of prickles or spines, but densely covered with pale yellowish-brown hairs, $\frac{1}{8}$th inch long. The leaves are simple, cordate, about 3 inches long by 2 inches wide, sharply toothed, the petiole, which is about $1\frac{1}{2}$ inches long, having the same hispid character as the stems; the under surface is covered with a close whitish felt and the midrib and chief veins are furnished with bristly hairs, whilst on the dark-green upper surface the hairs are confined in rows between the chief veins. The flowering stems are erect, the flowers white, 1 inch or rather more across, the fruit bright-red and of good size and flavour.

The plants at Kew were raised from seed collected for Harvard University and presented to Kew early in 1909.

As the species, according to Mr. Wilson, is found at elevations of about 10,000 feet in Western China, it will no doubt prove very hardy with us, and from its native habitats we may assume it will make an addition to that class of shrubs which thrive in shaded or semi-shaded positions—a class which cultivators will be glad to see augmented.

Rubus Veitchii, *Rolfe* in K.B. 1909, p. 258.

Of all the newer *Rubi* introduced from China, this will, I think, prove to be the most attractive. It is a bush of neat habit, with erect, terete, glabrous stems and slender branchlets, all covered with a purplish bloom and thickly furnished with straight slender prickles. The very handsome leaves are pinnate, up to 9 inches in length, with from three to six pairs of leaflets and a long pinnatifid terminal one. The lowest leaflets are from 1 to 2 inches long, ovate, coarsely and angularly toothed, each succeeding pair becoming smaller towards the apex ; they are lustrous-green above, and grey tomentose beneath. The common stalk is armed with prickles like the stems. The flowers are produced a few together in terminal flattish panicles, the calyx densely pubescent, the petals purple. Fruit of medium size, black covered with a purplish bloom.

This striking plant was discovered by Wilson in the Min Valley, Western China, where it grows in dry localities up to 7000 feet. It flowered with Messrs. Veitch in 1908. The Kew plants were raised from seeds sent by Harvard University in 1908.

Its purple stems and especially its handsomely divided leaves ought to make the species popular in gardens.

VIII.—TREES OF THE NORTH-EASTERN TRANSVAAL.

C. E. Legat.
(Conservator of Forests.)

Notes on the Tree Vegetation seen between Pietersburg and Messina, and between Louis Trichardt and Shewass in North-Eastern Transvaal, September 13th–30th, 1908.

The following notes and photographs by Mr. C. E. Legat have been sent to Kew by Mr. J. Burtt Davy, Botanist to the Transvaal Government. The route traversed by Mr. Legat was through a district situated in the extreme north-east of the colony, a region in which very little botanical collecting has been done.

The specimens gathered on the journey were, unfortunately, in many cases not sufficiently complete for a critical determination of the species, but better material could scarcely have been obtained owing to the unfavourable time of the year at which the visit was made.

The Transvaal Department of Agriculture published in 1907 a list of the native trees of the colony compiled by Mr. Burtt Davy, and the same author subsequently added a list of addenda in the *Kew Bull.*, 1908, pp. 145–175. The species recorded by Mr. Legat which are not included in those two lists are indicated by an asterisk. Where a name in the notes is followed by a number in brackets, the species in question has been collected by Mr. Legat and identified at Kew ; the numbers are those of the Herbarium of the Transvaal Department of Agriculture. In all other cases, except where otherwise noted, Mr. Legat is responsible for the accuracy of the names.

The collection contains at least one species of especial interest (no. 4899, p. 51), for the same plant was gathered by Dr. (now Sir John) Kirk at Tete on the Zambesi as long ago as 1860, and, so far as we are aware, has not been found since. It undoubtedly belongs to the *Leguminosae* and the leaves are very similar to those of *Schotia transvaalensis*, Rolfe. The fruits and seeds, however, are quite different.

Unfortunately, Kirk's and Legat's specimens alike consist of leaves and fruits only with no flowers, so that it has not been possible to fix the position of the plant in the order with any degree of certainty.

On the road from Pietersburg (4350 feet) to Klipdam (3950 feet) the following species were observed : *Dombeya rotundifolia*, *Sclerocarya caffra*, *Dichrostachys nutans*, *Acacia horrida*, and a species of *Munaulea*. This part of the country is of a level, sandy nature and is only lightly wooded.

In the vicinity of Klipdam, *Zizyphus mucronata* and *Acacia hebeclada* (in flower) were seen. Frost, sufficient to injure small Jacaranda trees, occurred here in July, 1908.

Between Klipdam and Dwars River (3550 feet) the country is more thickly wooded and very flat, but the climate is dry and the soil often shallow, so that the scrub never reaches much more than 20 to 25 feet in height. The following trees were noted : *Dovyalis* sp., *Sclerocarya caffra*, *Dichrostachys nutans*, *Peltophorum africanum*, *Acacia arabica*, *A. hebeclada* (in flower), *A. horrida*, and a species of *Combretum*.

At Dwars River three Acacia trees were found, namely : *A. glandulifera*, *A. Rehmanniana*, and *A. spirocarpoides*, the last flat-topped and with twisted pods.

From Dwars river to Bandolier Kop (3850 feet) the character of the vegetation is much the same as the last. It may here be mentioned that the Meteorological Department gives the height of Bandolier Kop as 3775 feet, showing that the aneroid used by me was, at least, approximately correct. The following trees were seen : *Dombeya rotundifolia* (in flower), *Zizyphus mucronata*, *Sclerocarya caffra*, *Peltophorum africanum*, *Acacia arabica*, *A. spirocarpoides*, and an arborescent species of *Euphorbia*.

Between Bandolier Kop and Louis Trichardt (3200 feet) the country is flat but the soil is less sandy and the trees are taller ; the following species were collected : *Elaeodendron* sp. (no. 4918), *Rhus* (*Ileeria*) spp. (nos. 4915 and 4917), *Ormocarpum* sp. (no. 4916), *Schotia brachypetala ?** (no. 4920), *Acacia robusta* (no. 4919), *Albizzia* sp. (no. 4921), *Combretum* spp. (nos 4914 and 4922), and *Carissa arduina* (no. 4913) ; in addition the following were seen but not collected ; *Dombeya rotundifolia*, *Sclerocarya caffra*, *Lonchocarpus Capassa*, *Acacia arabica*, *A. glandulifera* (in flower), *A. Rehmanniana*, and a species of *Ficus* which was first encountered at an elevation of 3200 feet.

Between Louis Trichardt and the lower edge (4800 feet) of the dense forest at Hangklip, *Acacia Davyii* and *A. natalitia* were collected (compared in Forestry Department Herbarium).

The forest at Hangklip, the upper limit of which is 5000 feet, faces south and south-east, the mountain itself being probably 200 feet higher, and contains the following trees: *Kiggelaria africana* (no. 4931), *Calodendron capense*, *Clausena inaequalis*, *Xanthoxylon capense*, *Trichilia* sp. (probably *T. capitata*), *Gymnosporia deflexa* (no. 4923), *Bersama* sp. nov. (no. 4927), *Rhus laevigata*, *Pygeum africanum* (Bitter-Almond), *Weihea* sp., *Combretum Kraussii*, *Tricalysia capensis* (no. 4929), *Maesa rufescens*,* *Rapanea melanophloeos*, *Royena Wilmsii* (no. 4928), *Halleria lucida*, *Xymalos monosperma*, and *Celtis* sp. (very common). Specimens of many of these species were not collected, being well known to Mr. Lane-Poole, the District Forest Officer at Woodbush, and myself.

From Louis Trichardt I trekked northward over the Zoutpansberg range which runs east and west. This is the range of which Hangklip (5200 feet) is a member. The road crosses the hills at an elevation of about 4000 feet. On the reverse slope from Louis Trichardt *Pterocarpus angolensis* and *Phoenix reclinata* first occur at about 3800 feet, the former disappearing at an elevation of 3500 feet and the latter, which grows in damp places and along the banks of streams, at 2700 feet.

Between the Zoutpansberg range and the next range northward and parallel to the first is a valley in which *Tecomaria capensis* (no. 4895) was gathered. The road which traverses the valley passes through the farm Mooiplaats (2900 feet) and crosses the mountain at Wylie's Gorge (2700 feet). Between the former place and Sulphur Springs (2600 feet) *Zizyphus mucronata*, *Lonchocarpus Capassa*, *Acacia pallens* (Knoppiesdoorn), *Combretum porphyrolepis* (Leadwood), and *Bolusanthus speciosus* were noted.

Immediately after passing through Wylie's Gorge and traversing the second range of hills from Louis Trichardt, the Baobab was seen for the first time. The specimens were dwarf and they occur on arid, hot and rocky slopes on the north side of the range down to about 3000 feet. These trees become larger and are found more frequently as Sulphur Springs is approached. They were quite leafless and not in flower and the fruits of the previous season were still hanging at the time of my visit.

From Wylie's Gorge to the Limpopo it was very noticeable that the trees were in a much less forward condition than those, even of the same species, on the south side of the Zoutpansberg range. The greater aridity of the country north of the mountain ranges may probably account for this, the spring apparently being influenced more by moisture than by warmth.

Between Wylie's Gorge and Sulphur Springs, *Cassia abbreviata* (no. 4912a) and *Elaeodendron* sp. (no. 4911) and another Celastraceous plant (no. 4912) were collected, and at Sulphur Springs *Maerua angolensis* (no. 4901), *Balanites* sp. (no. 4897), *Acacia clavigera** (no. 4900), another Leguminous plant (no. 4899, not determined), and a species of *Euphorbia*. The last-mentioned grows in almost pure sand in low, dense thickets. The Leguminous plant (no. 4899) is one of the few evergreen species occurring in this region. It becomes a fine umbrageous tree and appears to be confined to alluvial flats. Buck are said to eat the fruits. I did not see any others except those at Sulphur Springs hotel.

Copaifera Mopane is first met with five miles north of Sulphur Springs hotel and about a mile from the springs. It occurs there as pure scrub of an open character, attaining a height of from 5 to 15 feet, and growing in red sand from which grasses and other vegetation are conspicuously absent. A few miles further north, on better soil in company with grass, it is found from 20 to 40 feet high. Still further north I came across an area of this species only 2 to 5 feet high with grass growing amongst it. The soil in this locality, however, is poor and shallow. Between Blauwkop (2200 feet) and Messina (2000 feet) it grows mixed with other scrub and rarely reaches larger dimensions than 25 feet.

*Maerua rigida** ? (no. 4903) was collected at Blauwkop, and a species of *Sterculia* (no. 4904) between there and Sand River. At the latter place a species of *Boscia* (near *B. Pechuelii*) and *Acacia albida* were gathered. The Acacia grows to a large size and is found along the course of the river. [According to Rochebrune in "Toxicologie Africaine" this tree is the source of Gum Salabreda, a vermicelli-like gum which exudes in tears of the thickness of a goose-quill, more or less undulated, of a faintly yellowish colour with a finely fissured surface in small cubes, and breaking with a glassy fracture. In *Trans. Linn. Soc.*, Vol. xxix., p. 67, Grant states that the tree is known in Nubia under the name of "Laraz," and that the leaves are eaten by goats and the bark used in curing leather.] A fan-leaved palm, probably a species of *Hyphaene* which I did not collect, large sized leadwoods (*Combretum porphyrolepis*) and *Lonchocarpus Capassa* were fairly common at Blaauwkop.

Between this place and Messina, *Acacia Senegal** (no. 4910) was gathered. It grows very straight and is conspicuous on account of its height, often being half as tall again as the rest of the scrub. It was just breaking into leaf at the time of my visit.

At Messina, *Cassia abbreviata* (no. 4909) and *Acacia kwebensis** no. 4907) were collected. The following trees were also seen: *Adansonia digitata**, *Zizyphus mucronata*, *Sclerocarya caffra*, *Cassia* sp., *Copaifera Mopane*, *Lonchocarpus Capassa*, *Acacia pallens* and *Combretum* sp. The *Adansonia* occurs from north of Wylie's Gorge to the Limpopo, attaining larger dimensions and becoming more abundant as one proceeds northward.

Along the Limpopo, 12 miles north-west of Messina at an elevation of 1600 feet, the following trees were observed: *Adansonia digitata**, *Lonchocarpus Capassa*, *Copaifera Mopane*, *Acacia pallens* and the fever tree (*Acacia xanthophloea*) which was in flower. The abundance of scent emanating from the flowers of the last mentioned is remarkable, even for an *Acacia*. The banks of the river in this region are not nearly so densely wooded as might be expected, and the whole country from Sulphur Springs to the Limpopo is a low scrub-forest with open canopy. In places it is thick and almost impassable. This region is the most arid in the Transvaal, and in many places there is little sign of grass.

From Messina I returned to Louis Trichardt and set out again from there on September 24th for the farm Geluk (4200 feet) which lies about 20 miles to the north-east. The road passes along a valley formed between two parallel ranges of hills (part of the Zoutpansberg) running east and west. This valley is about a

TRICHILIA EMETICA.

EKEBERGIA MEYERI.

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mile wide and is well watered and fertile. The tree flora is interesting on account of the occurrence of the following species, which are common to the Drakensberg forest, but which grow here in clumps on the veld. It is probable that these clumps are the remnants of what was formerly continuous, dense forest, which, however, has been burnt out in comparatively recent times:—*Clausena inaequalis*, *Xanthoxylon capense*, *Rhus laevigata*, *Pygeum africanum*, *Brachylaena discolor*, *Rapanea melanophloeos*, and the Monkey Rope. On the sides of the hills bounding the valley were *Pterocarpus angolensis*, *Erythrina caffra*, species of *Combretum*, *Terminalia*, Thorns and Figs. The species collected were as follows: *Pittosporum viridiflorum* (no. 4888), *Garcinia* sp., probably *G. angolensis* (nos. 4883 and 4894), *Ochna pulchra?* (no. 4887), *Mundulea suberosa** (no. 4880), *Eugenia* sp. (no. 4889), *Canthium* sp. (no. 4885), *Pavetta* sp. (no. 4884), *Tricalysia* sp., near *T. jasminiflora* (no. 4881), and *Vangueria infausta* (no. 4883a).

Leaving Geluk I went on to Shewass viâ Fairview (2700 feet). At Fairview I found *Trichilia emetica* (Plate 1), *Ekebergia Meyeri* (no. 4879—Plate 2), and *Brachylaena discolor* (Vaalbosch).

[*Trichilia emetica*, Vahl., "Red Esschenhout" is widely distributed in Tropical Africa, and is valued for its seeds, which yield a high percentage of a fatty oil used in native cookery, and suitable for the manufacture of soap and candles. Considerable quantities of the seeds are imported into Marseilles from Inhambane for the extraction of oil for soap making. A full account of the uses of this tree is given in "Useful Plants of Nigeria," *Kew Bull., Additional Series* ix., p. 147.

Ekebergia Meyeri, Presl., "Essenwood" is used in Cape Colony for many purposes, such as carriage and wagon work, implements, &c., and is also said to be suitable for railway sleepers. According to Mr. W. Bazley, it is best known by its native name, Umnyamati. It grows to a large tree, with a trunk sometimes 5 feet in diameter. It is not a hard wood, nor can it properly be classed as a soft wood; although not very strong, it makes good useful boards for inside work, such as doors, boxes, &c. It does not stand well if exposed to wet or damp; in fact, in such situations, it decays in a short time; it has something of the grain of ash. It is a fine spreading tree, and looks well when in full foliage, but gaunt when bare in the summer months.

The bark has been used for tanning leather, and the roots by the natives as a remedy for dysentery. Fourcade states that the bark is poisonous, and is used by the natives in small doses as an emetic. (Wood & Evans, Natal Plants, i., 1899, p. 8, with pl. 6.)].

Brachylaena discolor and *Pygeum africanum* (Bitter Almond), seem to be the same as the Drakensberg trees which occur in the open veld.

Parinarium Mobola (nos. 4878 and 4930) becomes increasingly plentiful as Hood's Store (2200 feet) and Palmary's Store (2200 feet) are approached. It grows to a tree 30 to 40 feet high, with a stem 18 inches in diameter. In places it forms bush with complete canopy, the crowns interlacing. Natives, when driven by necessity, make beer from the fruits. This part of the country is well watered, and the character of the vegetation indicates a high

rainfall, probably not less, on an average, than an annual fall of 50 inches. *Rauwolfia natalensis* is common in this stretch of country, and at Palmaryville (2200 feet) I came across a specimen of *Oncoba spinosa* (identified by the Govt. Botanist).

On the road to Shewass from Palmaryville, *Pygeum africanum* and *Brachylaena discolor* were growing on the open veld at 2300 feet. The occurrence of these species in this district serves to indicate the moist nature of the climate.

At Shewass (3400–3500 feet) there is a dense forest which runs east and west and has an eastern exposure. The elevation of the bush is from 3200–3600 feet and the trees are from 50–75 feet high. This forest differs entirely from the yellow-wood forests of the Drakensberg; the number of species occurring in it is comparatively small, and several of them are, I think, unrecorded for the Transvaal. The principal trees are *Albizzia fastigiata** (no. 4867) and *Chrysophyllum Magalis-montana* (no. 4824), whilst others noted included the following: *Trichilia emetica*, *Rhus laevigata*, *Combretum Kraussii* (Vaterlands Wilge), *C. holosericeum** (no. 4868), *Anthocleista zambesiaca* (common) and a species of *Ficus* (no. 4875). The *Chrysophyllum* attains a height of 30–40 feet, whilst *Combretum holosericeum* reaches 50 feet with a trunk 18 inches in diameter, and has a bark which resembles that of *Curtisia*. *Albizzia fastigiata**, presumably the "Flat Crown" of Natal, grows to a height of 50 feet, with a bole of 20 feet and a diameter of 2 feet. The natural regeneration of this species is very good. Other trees noted in the bush were *Acacia ataxacantha*, *Brachylaena discolor*, *Maesa rufescens*, *Nuxia floribunda*, and the cabbage-wood, whilst the following were collected: *Neumannia theaeformis** (no. 4872), *Rawsonia lucida* (no. 4869), *Pterocelastrus* sp. (no. 4822), *Albizzia fastigiata** (no. 4867), *Combretum holosericeum** (no. 4868), *Eugenia* spp. (nos. 4826 and 4876) *Grumilea* sp. (no. 4870), *Chrysophyllum Magalis-montana* (no. 4824), *Landolphia* sp. (no. 4874), *Bridelia micrantha* (no. 4823), and a species of *Ficus* (no. 4875).

Parinarium Mobola and *Pterocarpus angolensis* (in flower) were seen round the edges of the bush on the slopes of the hills. Throughout the forest the *Landolphia* vine (no. 4874) is common, climbing right into the crowns of the trees. Though rather early in the season, I collected a small quantity of rubber which appears to be of excellent quality. I found this vine at the Pipiti Falls and it also occurs at Tengive, Makundi Nek, Luimbi, Ishautu, Wuba and many other places in the N.E. Transvaal. It grows mainly in forest composed of *Chrysophyllum* and *Albizzia*. The Bavenda name of the rubber is "Mavungo."

On the mountain ridge forming the northern boundary of the Shewass bush and facing due south is a normal forest, similar to the Houtbosch or the Drakensberg. There is, however, no undergrowth of shrubs in the forest, only grass being found beneath the trees, yet the canopy is continuous though not so dense as that of the Drakensberg forest. The lower and upper ridges are approximately 3600 feet and 3800 feet respectively. Ferns and mosses were entirely absent. The following species were noted: *Xanthoxylon capense* (Paardepraam), very abundant, *Acacia ataxa-*

cantha, *Combretum Kraussii*, *Eugenia* sp., *Cussonia* sp., *Gardenia Rothmannia*, *Brachylaena discolor*, *Maesa rufescens*,* *Rapanea melanophloeos*, *Nuxia floribunda*, *Halleria lucida*, and *Xymalos monosperma*. The last mentioned species was scarce and usually very dwarf. *Neumannia theaeformis** and *Ekebergia Meyeri* were common at Shewass.

At Pipiti Falls, halfway between Shewass and Palmaryville, I came across *Adina Galpini* and *Tricalysia capensis* (no. 4873).

From Shewass I visited Tschoma mission station (2400 feet) and collected a species of *Acacia* (no. 4821). This tree was not more than 20 feet high but the spread of its branches was 90 feet.

Bauhinia reticulata (no. 4820) was collected close to Fonseka. Only one Baobab, and that a small specimen, was seen on the Shewass trip. It was found between Fairview and Palmaryville.

On the mountain above Tschoma mission station is found Drakensberg forest, but, owing to unfavourable weather and the short time at my disposal, only a cursory examination could be made of it. Black stinkwood (*Ocotea bullata*), however, was fairly common.

Explanation of Plates.

1. *Trichilia emetica*, Vahl., "Red Esschenhout" at Fairview, Spelonken, Zoutpansberg.

2. *Ekebergia Meyeri*, Presl., Essenwood (Essenhout or Esschenhout), Fairview, Spelonken, Zoutpansberg.

IX.—DIAGNOSES AFRICANAE: XXXIV.

1071. **Chironia (Plocandra) humilis**, *Gilg*, **var. zuluensis**, *Prain* [Gentianaceae-Chironieae]; varietas distincta habitu inflorescentiaque *C. humili*, Gilg, var. *Wilmsii* simillima, sed caulibus saepe a basi ramosis, foliis radicalibus evanidis, caulinis inferioribus obovatis obtusis 2·5–4 cm. longis 1–1·5 cm. latis, superioribus lanceolatis acutis 2 cm. longis 4 mm. latis nec plane linearibus recedit et de *C. purpurascente* typica meminit. *C. purpurascens*, Prain in Dyer, Fl. Cap. iv. 1. 1108 partim et quoad spp. in ditione Zulu a d^a^ McKenzie lecta tantum.

South Africa. Zululand: Ginginhlovu, 30–35 m. alt., *Wylie in Herb. Wood*, 11,355; without precise locality, *Mrs. McKenzie*.

This rather distinct form combines the short primary peduncles of *C. humilis* with foliage unlike that of either of the varieties of that species and much more like the foliage of typical *C. purpurascens*. On this account the only, and somewhat imperfect, specimens of this plant, collected somewhere in Zululand by Mrs. McKenzie, in the herbarium at Kew when the account of the genus *Chironia* was drawn up for the *Flora Capensis*, were referred to *C. purpurascens*. The communication by Mr. Medley Wood in October, 1909, of some excellent specimens of this plant obtained by Mr. J. Wylie in the same region, has shown that it is necessary to accord it separate treatment. Those who adopt the view that *C. humilis* and *C. Wilmsii* are conspecific must treat this Zululand

plant as a form of the same widened species; those who are constrained to consider *C. humilis* and *C. Wilmsii* distinct, will probably consider the plant now characterised a separate species.

1072. **Microtea gracilis**, *A. W. Hill* [Phytolaccaceae-Rivineae]; *M. Burchellii*, N.E. Br., similis sed foliis longioribus, inflorescentiis tenuibus gracilioribus, stigmatibus brevioribus et fructibus inconspicue costatis differt.

Annua 9–23 cm. alta, caules singuli superne ramosi. *Folia* elliptico-linearia, acuta, mucronulata, subherbacea, 2–4 cm. longa, fasiculata, densa. *Inflorescentia* gracilis, spicata, 6–15 cm. longa, inferne sterilis, superne floribus laxe dispositis; bracteis perianthio subaequalibus triangulari-ovatis acutis subintegris vel paullo 3-dentatis. *Perianthii* segmenta 5, 1 mm. longa, inaequalia, late vel anguste elliptica, obtusa. *Stamina* 4, filamentis perianthio longioribus. *Ovarium* ovoideum, stigmatibus 2–4 erectis brevibus plus minusve concretis. *Fructus* globusus, 1 mm. diametro, costatus, costis 4 primariis et intermediis interruptis inconspicuis.

South Africa. Eastern region and Mozambique: Komati Poort, 300 m., *Schlechter*, 11,806.

1073. **Amanoa Schweinfurthii**, *Baker et Hutchinson* [Euphorbiaceae-Phyllantheae]; affinis *A. bracteosae*, Planch., a qua foliis apice rotundatis et leviter emarginatis facile distinguitur.

Frutex glaber, circiter 3 m. altus. *Rami* robusti, longitudinaliter sulcati, ramulis floriferis glaucescentibus. *Folia* oblanceolata vel oblongo-elliptica, basi acuta, apice rotundata et leviter emarginata, 7·5–10 cm. longa, 2–4·5 cm. lata, subcoriacea, supra subnitida, subtus glauca, nervis lateralibus utrinque 12–14 arcuatis subtus leviter elevatis, venis laxis vix elevatis; petioli laeves vel paulo rugosi, supra late canaliculati; stipulae oblique et late ovatae, 3·5 mm. longae, basi 4 mm. latae, coriaceae, dorso bicarinatae. *Flores* fasciculati, axillares, in ramulis lateralibus brevibus foliatis dispositi; bracteae ovatae, submembranaceae, glabrae. *Flores* ♂ juniores tantum visi. *Sepala* 5, ovata vel triangulari-ovata, coriacea, glabra. *Petala* oblonga, obtusa, subcoriacea, glabra. *Ovarii rudimentum* breve, trifidum, glabrum. *Flores* ♀ ignoti.

Tropical Africa. Nile-land: Jur; Mayob, *Schweinfurth*, 1544.

1074. **Megabaria**, *Pierre MSS. ex Hutchinson*; *De Wild. Étud. Fl. Bas.- et Moy.-Congo* ii. 284 (nomen) [Euphorbiaceae-Phyllantheae]; genus novum, inter Phyllantheas africanas simplicifolias inflorescentia terminali paniculata et capsula loculicide dehiscente distincta.

Flores dioici, petaliferi. Fl. ♂: *Sepala* 5, imbricata. *Petala* 5, sub disco inserta. *Disci* glandulae 5. *Stamina* 5, inter lobos disci inserta, sepalis opposita; filamenta libera; antherarum loculi distincti, paralleli, longitudinaliter dehiscentes. *Ovarii rudimentum* obconicum, supra complanatum. Fl. ♀: *Sepala* et *petala* maris. *Discus* breviter cupularis, undulate lobatus. *Ovarium* 3-loculare; stigmata 3, reflexa, integra; ovula in loculis gemina. *Capsula* ellipsoidea, integra, loculicide dehiscens, columellam persistentem relinquens, exocarpio crustaceo, endocarpio tenuiter corneo. *Semina* ambitu elliptica; testa e stratis 3 composita; stratum extimum (epidermis)

rubrum vel rubro-fuscum, nitidum, intermedium albidum, spongiosum, intimum crustaceum; albumen parcum; embryo rectus, cotyledonibus planis latis.—Arbores. Folia alterna, laxa vel conferta, petiolata, integerrima, pennivenia. Paniculae terminales, ad apices ramulorum confertae.

Species 2.

Megabaria Trillesii, *Pierre MSS. ex Hutchinson*; *De Wild. Etud. Fl. Bas.- et Moy.-Congo* ii. 284 (nomen).

Arbor, ramulis teretibus glabris. *Folia* obovata vel elliptica, basi obtuse cuneata vel rotundata, apice obtusa vel rotundata, 9–17 cm. longa, 4–11·5 cm. lata, rigide chartacea vel tenuiter coriacea, utrinque glabra et opaca, nervis lateralibus utrinque 6–8 arcuatis versus marginem anastomosantibus supra distinctis subtus prominentibus, nervis tertiariis reticulatis utrinque distinctis; petioli 1–9 cm. longi, apice tumidi et rugosi, glabri; stipulae caducae. *Paniculae* ♂ ad apices ramulorum confertae, usque ad 9 cm. longae, axibus robustis sulcatis dense puberulis; rami spiciformes, circiter 1 cm. longi, basi ad 4 mm. nudi, unibracteati; bracteae late ovatae, apice rotundatae, 3 mm. latae, ciliatae et puberulae. *Sepala* 5, late ovata, obtusa, 1·5 mm. lata, versus marginem membranacea, breviter ciliata, extus parce et minute puberula. *Petala* parva, plus minusve elliptica vel obovata, apice 2–3-dentata. *Stamina* 5; antherarum loculi paralleli. *Disci* glandulae glabrae. *Ovarii rudimentum* columnare, apice complanatum, glabrum. *Flores* ♀ non visi. *Paniculae* fructiferae usque ad 15 cm. longae, axibus angulatis sulcatis minute puberulis. *Capsula* subsessilis vel breviter pedicellata, ellipsoidea, 2 cm. longa, 1·7 cm. diametro, exocarpio crustaceo 1·5 mm. lato, endocarpio tenuiter corneo. *Semina* ambitu elliptica, circiter 1·3 cm. longa, 1 cm. lata, rubra, nitida.

Tropical Africa. Cameroons: Bipinde, *Zenker*, 1083, 2572, 2603, 2846, 3556. Gaboon: Bata, *Trilles*, 157. Belgian Congo: Islands in the Lulanga River, *Dewevre*, 856; Eala, *Laurent*, 2035; Bolombo, *Laurent*.

I have not examined the specimens from the Belgian Congo..

1075. **Megabaria ugandensis**, *Hutchinson*; affinis *M. Trillesii*, Pierre, sed paniculis majoribus glabris differt.

Arbor 15 m. alta vel ultra, ramulis robustis glabris. *Folia* ad apices ramulorum conferta, late elliptica vel ovato-elliptica, apice obtusa vel breviter acuminata, basi rotundata vel paulo cuneata, 7·5–28 cm. longa, 5–15 cm. lata, chartacea vel tenuiter coriacea, utrinque glabra et opaca, nervis lateralibus utrinque 6–14 arcuatis versus marginem ramosis subtus prominentibus, tertiariis reticulatis laxis subtus distinctis; petioli 1·5–15 cm. longi, teretes, glabri, apice tumidi et rugosi; stipulae caducae, oblongae, obtusae, 4 mm. longae, 1 mm. latae, versus marginem membranaceae, glabrae. *Paniculae* ♂ ad apices ramulorum confertae, 15–20 cm. longae, axibus angulatis leviter sulcatis glabris; rami primarii graciles et elongati, inferiores usque ad 12 cm. longi; ramuli ultimi spiciformes, usque ad 1·3 cm. longi, basi nudi, unibracteati; bracteae late ovato-triangulares, usque ad 5 mm. longae et 3 mm. latae, versus marginem membranaceae, glabrae. *Sepala* 5, late ovata, membranacea, glabra. *Petala* 5,

parva, elliptica, membranacea, glabra. *Stamina* 5 ; filamenta quam sepala duplo longioria. *Disci* glandulae carnosae, glabrae. *Ovarii rudimentum* columnare, crassum, apice complanatum, glabrum. *Inflorescentiae* ♀ paniculato-racemosae ; bracteae maris ; flores breviter pedicellati, pedicellis fructiferis elongatis. *Sepala* et *petala* maris. *Discus* breviter cupularis, undulate lobatus, glaber. *Ovarium* ovoideum, glabrum ; stigmata parce papillosa. *Capsula* ellipsoidea, utrinque leviter cuspidata. *Semina* ambitu elliptica, circiter 1·3 cm. longa, 1 cm. lata, rubra, nitida.

Uganda. Luanhabya Forest, *Dawe*, 760 ; Entebbe, *Bagshawe*, 723.

Dr. Bagshawe states that this species is usually found in damp soil, and that the leaves are copper-coloured and said to be poisonous.

1076. **Thecacoris Batesii**, *Hutchinson* [Euphorbiaceae-Phyllantheae] ; affinis *T. stenopetalae*, Muell.-Arg., sed floribus masculis glabris differt.

Suffrutex circiter 0·6 m. altus. *Rami* glabri. *Folia* obovata, basi plus minusve cuneata, apice acute acuminata, 7·5–13 cm. longa, 4–6·5 cm. lata, utrinque glabra et opaca, nervis lateralibus utrinque 5–6 arcuatis subtus elevatis, venis laxis inconspicuis ; petioli crassi, 4–6 mm. longi, glabri vel supra minute puberuli ; stipulae ovato-lanceolatae, acuminatae, acutae, 6 mm. longae, glabrae vel juniores minute puberulae. *Spicae* ♂ vix ultra 2 cm. longae, glabrae, bracteis lanceolatis acutis breviter ciliatis. *Calycis* segmenta suborbicularia, minute ciliata. *Petala* lanceolata, acutissima. *Disci* glandulae truncatae, carnosae, glabrae vel minute et parce puberulae. *Ovarii rudimentum* obconicum, truncatum, integrum, glabrum. *Flores* ♀ juniores ignoti. *Capsula* triloba, depressa, fere 1 cm. diametro, lobis obtusis. *Semina* unilateraliter compressa, 4 mm. longa, nitida. *Pedicelli* fructiferi robusti, 5 mm. longi, minute puberuli ; bracteae ovatae, acutae, fere 4 mm. longae, ciliatae.

Tropical Africa. Cameroons : in bush along the path from the Batanga mission to Bongahela, *Bates*, 174.

1077. **Cleidion Mannii**, *Baker* [Euphorbiaceae-Crotoneae] ; species *C. gabonico*, Baill., affinis foliis tamen basi rotundatis ibique manifeste 3-nerviis differt.

Frutex scandens, 4·5–5-metralis, ramulis gracilibus glabris. *Folia* longe petiolata, oblonga, 6–8 cm. longa, 4–5 cm. lata, apice caudata, basi rotundata, membranacea, glabra, 3-nervia nervo centrali nervos secundarios suboppositos 3-jugos emittente. *Racemi* masculi breviter pedunculati, laxi, 7–10 cm. longi, ramulos breves patentes vel deflexos emittentes ; ramuli superiores 1-flori, caeteri 2–4-flori ; pedicelli filiformes, flores excedentes ; bracteae minutae, acutae ; alabastra globosa, glabra, 1·5 mm. diametro. *Sepala* oblonga. *Stamina* in capitulum globosum sepalis paullo brevius aggregata. *Flores feminei* ignoti.

Tropical Africa. Upper Guinea : Cameroons river, *Mann*, 1202.

1078. **Stylochiton Dalzielii**, *N. E. Brown* [Aroideae-Stilochitoneae] ; affinis *S. Barteri*, N. E. Br., sed spatha longiore acuminata et perianthio masculo tridendato differt.

Herba perennis. *Tuber* vel rhizoma erectum, 2–5 cm. longum, 1·5–1·8 cm. crassum, annulato-constrictum, basi truncatum, luteum, radices 2–5 mm. crassas emittens, 2–3-foliatum. *Foliorum* petioli 8–15 cm. longi, inferne vaginati; laminae 10–15 cm. longae, 3·5–6·5 cm. latae, sagittatae vel cordato-sagittatae, utrinque glabrae, lobis basalibus 2–3·5 cm. longis, lobo antico 8–12 cm. longo deltoideo-ovato vel anguste lanceolato. *Inflorescentia* solitaria, ante folia evoluta. *Pedunculus* 4–5 cm. longus. *Spatha* erecta, glabra; tubus 2·5 cm. longus, medio constrictus; lamina 2·7 cm. longa, lanceolata, concava, attenuato-acuta. *Spadix* 4·3 cm. longus. *Flores feminei* 5, monocycli, liberi; perianthium 5–6 mm. longum, urceolatum, ore contractum, oblique truncatum; ovarium liberum; stylus ultra perianthium 3 mm. exsertus; stigma capitatum. *Flores masculi* a floribus femineis interstitio 4–5 mm. longo separati et in spicam circa 3·3 cm. longam dispositi; perianthium 1 mm. longum, profunde trilobum vel tridentatum; stamina 3, filamentis antheris subaequilongis.

Northern Nigeria. Yola: very abundant in the northern Katagum district, *Dalziel*, 237.

According to Dr. Dalziel the rhizome of this plant is bright yellow, and the young leaves are used as a pot-herb after boiling away the acridity.

1079. **Anthoxanthum brevifolium**, *Stapf* [Gramineae-Aveneae]; affine *A. madagascariensi*, Stapf, et *A. Ecklonii*, Stapf, sed ab utroque foliis brevibus latisque, a priore praeterea glumis valvisque vacuis minus hyalinis latioribus, hisce magis pilosis et aristis validioribus munitis, ab altero spiculis minoribus distinctum.

Herba perennis, caespitosa; culmi florentes circa 20 cm. alti, laeves, glabri, 2-nodi, internodio summo ultra 5 cm. longo longe exserto. *Folia* laevia, glaberrima; vaginae striatae, summa superne subampliata, circiter 5 cm. longa, basales et innovationum breves; ligulae hyalinae, 0·5–1 mm. longae; laminae basales lineari-lanceolatae, acutae, 2·5–3·5 (rarius ad 4) cm. longae, ad 6 mm. latae, planae, firmulae, multinerves, caulinae superiores admodum redactae. *Panicula* spiciformis, 3–4 cm. longa, contracta; rhachis laevis; rami geminati, inaequales, alter ad 2 vel saepius 1 spiculam redactus, laeves; pedicelli laterales perbreves, omnes apice patule pilosi. *Spiculae* stramineae, fusco- vel fusco-purpureo-variegatae, circiter 7 mm. longae. *Glumae* a latere visae oblique lanceolatae, subacuminatae, ad carinas vix asperulae, inferior 5 mm. longa, 1-nervis, subhyalina, superior 7 mm. longa, 3-nervis, inter nervos herbacea, caeterum hyalina vel subhyalina. *Valvae* 2 inferiores vacuae, subaequales, a latere anguste oblongae, 4–4·5 mm. longae, rufescentes, pilosae, 5-nerves, inferior supra medium arista recta 3 mm. longa, superior infra medium arista geniculata ad 7 mm. longa munita; valva fertilis 2·5 mm. longa, laevissima.

South Africa. Cape Colony: Barkly East Division; on Ben McDhui (Wittebergen), 2955 m., *Galpin*, 6884.

1080. **Achneria Galpinii**, *Stapf* [Gramineae-Aveneae]; affinis *A. curvifoliae*, Hack., sed foliis latioribus involutis (haud canaliculatis) longe acutatis et spiculis majoribus distincta.

Herba perennis, dense caespitosa; culmi graciles, erecti, 12–15 cm. alti, laeves, glabri, indivisi, 2-nodi, internodiis exsertis. *Folia*

glabra, laevia ; vaginae superiores superne tumidulae, infimae diu persistentes, fuscae ; ligulae ad ciliola redactae ; laminae foliorum basalium lineares, longae, acutatae, 2–3 cm. longae, rigidulae, superne vel tota longitudine involutae, foliorum caulinorum multo breviores. *Panicula* dense contracta, 1–2 cm. longa, oblonga ; rhachis ramique parce minutissime tuberculati et ad nodos pubescentes ; rami ramulique 2-nodi, capillares, rigiduli, scaberuli (saltem ramuli), rami infimi ad 2 cm. longi ; pedicelli inaequales, 3–1 mm. longi, scaberuli. *Spiculae* stramineae, congestae, ad 4 mm. longae. *Glumae* oblique lanceolatae, acutae, subchartaceae, glabrae, nitidulae, 1-nerves, subaequales. *Valvae* oblongo-lanceolatae (a latere) subacuminatae, submucronulatae, 3 mm. longae, membranaceae, in dorso et ad margines basin versus pilosulae, obscure 5-nerves ; paleae quam valvae paulo breviores, 2-nerves.

South Africa. Cape Colony : Barkly East Division ; slope of Ben McDhui (Wittebergen), 2955 m., *Galpin*, 6915.

X.—FORESTS OF THE GOLD COAST.

The recently issued Report on the Forests of the Gold Coast* by Mr. H. N. Thompson, Conservator of Forests, Southern Nigeria, demands careful perusal and attention since the general principles laid down are applicable not to the Gold Coast only but to tropical forests in general.

The Report occupies 238 pages and is divided into three parts with an appendix, list of vernacular names, twenty-four plates and a comprehensive index.

In the first part the various forest areas of the Gold Coast are described in detail, the value of their component trees is discussed and suggestions are made for their preservation or exploitation. Mr. Thompson is careful to point out the prime importance of the Forest to the Gold Coast Colony, and brings forward many illustrations of the irreparable damage which is being done by the reckless felling of trees, in connection principally with clearings for native cultivation. Before making any detailed comments on the first part the second and more general part of the Report may be considered. This is in some ways the most important portion and certainly the part of most interest to the general reader.

The importance of Forests is so well stated that the paragraphs relating to their effects on the physical and climatic conditions of a country are taken *verbatim* from the report.†

"1. They mitigate extremes of temperature and render the climate more equable.

"2. They exert a marked effect in regulating the water supply, more especially by ensuring the sustained feeding of springs and thus rendering the flow of water in rivers more continuous, and in tending to reduce the danger of violent floods.

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* Gold Coast. Report on Forests by Mr. H. N. Thompson—Col. Rep. Misc. No. 66, 1910.

† Thompson l.c., p. 102.

"3. They increase the relative humidity of the air, and in consequence reduce the amount of evaporation. This effect is strongly marked on hills in the tropics.

"4. By the mechanical action of their roots and stems the plants composing forest vegetation assist in preventing land-slips, erosion of hill-sides, the silting up of rivers, and arrest the progress of shifting sands.

"5. They tend to increase the precipitation of moisture.

"6. They act as wind-breaks, and protect adjoining cultivated areas against the action of cold or dry wind.

"7. They act as barriers against the spread of fungoid and insect attacks from one cultivated centre to another.

"Almost all these effects are more pronounced in the tropics, especially in localities with well-marked wet and dry seasons, than they are in the temperate zone."

The regulation of the water supply is one of the most important and far reaching effects of forests in such a country as the Gold Coast. With the cutting down of forests a gradual change in the vegetation at once sets in, if such forest be well within the region of 'Rain Forest' no very serious consequences may result, if, on the other hand, the forest area lies on the borders of the rain forest region the reckless cutting down of the tree vegetation will so alter the conditions that the character of the country will quickly change from that of rain forest to deciduous forest and finally to that of the Savannah country. The places once occupied by trees will be invaded by grasses and as soon as they have established a footing the forest is doomed; the region becomes exposed to forest fires, the rainfall is not retained by the ground and the head waters of the springs, formerly receiving a constant supply of water from the damp forest-covered hill-sides, now obtain a torrential supply of water during the rains but are waterless during the dry season. The action of cutting down forest under such conditions not only may cause infinite harm in the actual region but may also cause much injury to areas far distant by interference with the proper water supply. Mr. Thompson points out that with the alteration in conditions of the forest the majority of the species of timber and other important trees confined to the moist evergreen forests disappear and all such agricultural crops which depend on moist conditions, as cocoa, rubber, &c. will also suffer and their cultivation may utimately become impossible.

It is clear therefore that the Forests of the Gold Coast and of our other West African possessions need efficient control and supervision.

Mr. Thompson deals very fully with this side of the subject and points out the lines which legislation might follow. The chief danger menacing the Gold Coast Forests is not their over-exploitation for forest produce but their wholesale destruction for farming purposes. It would appear, therefore, that any measures adopted for the "reservation" or "protection" of the forests should also be accompanied by provision for the instruction of the natives in methods of more intensive agriculture. At page 82 of the Report some general remarks will be found on the question of agricultural instruction in its relation to forestry.

Mr. Thompson makes a very interesting and apt comparison between the forests of the Gold Coast and those of the Southern Shan States of Burma, and it is possible that the policy followed in the East might prove suitable for the conditions which obtain in West Africa. Of the arrangements suggested, perhaps the most important are those relating to forest taxes, the sale of timber, and the revenues derived therefrom.

In concluding this section on the protection of the forest, it is conceded that something might be done in the way of persuading chiefs to look after the forests but it is only a method of chance depending on the influence of a few officials and is a slow process, "meanwhile the forests are being rapidly destroyed." It may confidently be asserted that no real progress has or ever will be made in Forest Conservancy unless the Supreme Government reserves to itself the right to direct and regulate its application. It is only the Government that can have the tenacity of purpose to carry the forests through the various vicissitudes and bring them into an organised condition capable of ensuring a sustained and increasing yield of produce in the future.

In the first part of the Report detailed information of the forests and of the condition of the country is given on which the general account of the second part is largely based.

The Aburi hill forests (*v.* p. 10), situated on the edge of the Accra plains afford a useful but disastrous object lesson of the effect of removing the forest. Cassava farms, made by clearing the forest, when abandoned to lie fallow become occupied by grasses and as the grasses are burned every year the exposed soil is washed away during the rainy season and denudation of the hillsides begins.

The drying up of streams, which is also associated with forest destruction, has actually occurred fairly recently in two instances near Aburi. In some cases the natives in clearing the forest leave some of the largest trees as standards and on such ground a tangled mass of vegetation springs up. Conspicuous among trees in such secondary growth is the "umbrella tree" *Mussanga Smithii* (Plate 24), which grows rapidly and has a dense canopy of leaves and though the value of the forest as far as produce is concerned is lost, still the ground is not exposed to the dessicating action of sun and wind or to the force of the rain and the physical effects of complete forest destruction do not occur. The umbrella tree, however, has this disadvantage that owing to its dense shade the growth of more valuable species is delayed.

At the commencement of Chapter ii., useful information is given as to some of the more important timber trees, such as *Piptadenia africana*, *Triplochiton Johnsonii*, *Terminalia superba*, one of the shingle trees, the Khayas, *Sarcocephalus esculentus*, and others. Of the "Waw-waw," *Triplochiton Johnsonii*, Mr. Thompson remarks "It is quite good enough in quality to replace the imported pitch-pine and it is extremely abundant: our West African forests contain sufficient supplies not only to meet large demands for it in the home markets, but also in the local ones."

Chlorophora excelsa (Plate 23), "Odoum" furnishes the best all-round timber in tropical West Africa, it is plentiful in Ashanti; among other trees of first importance are the West African cedars of the genus *Pseudocedrela* (Plates 10–13).

The genus *Khaya*, the Gold Coast mahogany, is represented by several species; five are figured in the Report (Plates 4–8 incl.). It is unfortunate that the species known as "Dubini" by the Fantis has not yet been properly determined owing to lack of sufficient material, since it is stated that the bulk of the Gold Coast mahogany is afforded by this species (Plate 8).

In addition to *Piptadenia africana*, a common timber tree, there is another species figured in the Report at Plate 17 under the name *Piptadenia* sp., a timber tree of some importance and very prevalent in Southern Ashanti.

Since the publication of the Report this species has been identified with *Cylicodiscus gabunensis*, Harms, a plant which was, until lately, very imperfectly known. *Cylicodiscus* was originally described from flowering specimens collected by Soyaux in Gaboon and by Staudt in the Cameroons, whilst the fruits served for the basis of another new genus, *Cyrtoxiphus*, and it was not until 1906 that Harms recognised that the latter represented the fruiting condition of the former. The genus *Cylicodiscus* differs from *Piptadenia* firstly in the presence of a disc inserted between the stamens and the base of the gynophore, and secondly in the very long woody pods. *C. gabunensis* was also discovered in Southern Nigeria by Dr. Unwin and Mr. Foster, and its area extends evidently throughout the greater part of the West African forest region.

A good timber which also yields a first-class fuel is the "Kokoti," to which the name *Pynaertia ealaensis* is given in the Report. A note on this tree appeared in the *Kew Bulletin*, 1909, pp. 309–312, in which it is shewn that this tree, a member of the natural order *Rhizophoraceae*, should be referred to Engler's genus *Anopyxis* and should bear the name *Anopyxis ealaensis*.

Mr. Thompson points out the wealth of the Ashanti forests, which contain large quantities of Pseudocedrelas, Khayas, Funtumias and other valuable trees. He is of the opinion that a special effort should be made to protect these forests and bring them under organized control. It is perhaps fortunate that at present the mass of this forest area is not easily accessible.

Of these forests in general he remarks: "I think that in number and variety of valuable trees these extensive forests of Western Ashanti will be hard to match anywhere in Africa. Moreover, the undergrowth is not so dense as that prevailing in evergreen forests to be met with near the coast, and in consequence the natural regeneration of the more important species is far more satisfactory and the gaps in the various age gradations less pronounced."*

The Savannah forests of North-Western Ashanti appear to be in greater need of forest conservancy in some ways than the forests of the moist regions, since they form the belt between the open grass land and the country where there is greater moisture. It is in this region of mixed deciduous forests that fire protection is an essential

* Thompson l.c., p 61.

feature of any conservancy programme. The timber in this region is also valuable, including such trees as *Khaya senegalensis*, the "dry zone" maghogany, *Afzelia africana*, and the "dry zone" cedar, *Pseudocedrela Kotschyi*, all suitable for the home market. As mentioned before the proper preservation of such forest areas as these is intimately bound up with far-reaching questions of water supply.

In discussing the question of reserved areas Mr. Thompson lays stress on the necessity of reserving the forests clothing the *crests of the hills* and the *steep slopes* from the operations of the farmer on the general grounds of preserving the climatic conditions that are of most value to the country.

When discussing the dry open country of the Afram plains (Report, pp. 84–92) some useful information is given as to the various plants and trees of this region from which it appears that the list of useful plants is one of some length and includes plants of considerable value.

A few remarks on the subject of game and game laws are of interest and deserve attention. It is pointed out that whilst Europeans are obliged to take out licences and are restricted as regards the shooting of certain species, no steps whatever have been taken to limit in any way the incessant slaughter carried on by the natives. The European's bag is as nothing compared with the annual bag of the native and game preservation at present is a failure. The hunting class appears to be composed of those who were formerly the fighters and now, owing to peaceful times, having been deprived of this employment, have taken to the chase of wild animals with renewed energy.

In conclusion, it may be pointed out that the problems confronting the Gold Coast Colony with regard to its forests are difficult and serious, since the preservation of the evergreen forests, on which the water supply so largely depends, and of the deciduous forests forming a belt against the Savannah Country, is at stake, and with this is bound up the general character of the agricultural operations of the colony. The most pressing need in connection with forest conservancy is the prevention of the wholesale destruction of the forest for farming purposes, in comparison with which the accumulated effect of timber exploitation is stated to be "a mere bagatelle."

XI.—MISCELLANEOUS NOTES.

Miss E. M. Wakefield, lately of the School of Rural Economy, Oxford, has been appointed by the President of the Board of Agriculture and Fisheries to the post of Assistant in the Royal Botanic Gardens, Kew.

Mr. Thomas Douglas Maitland, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of Southern Nigeria.

A Hybrid Strelitzia.—In the Mexican house at Kew there is now in flower for the first time a hybrid *Strelitzia*, the result of crossing 11 years ago *S. Reginae* and *S. augusta*, the former being the mother parent. The plant is 5 feet high and has 10 leaves shaped as in *S. augusta*, but the petioles are 18 inches long and the blades 2 feet by 15 inches. The peduncle is axillary, 18 inches long; the spathe is horizontal as in *S. Reginae*, with several vertical flowers, which expand in slow succession and are of a pale watery-yellow colour. There is a wide difference between the two parents, *S. augusta* having a woody stem 12 feet or more high and distichous leaves of which the petioles are 6 feet and the cordate blade 3 feet long; the peduncle is very short and stout, the spathe is purple and the flowers are white. *S. Reginae* has no distinct stem, but the tuft of leaves spring from a fleshy rootstock; the petioles are 3 feet long and slender, and the blades measure a foot by 4 inches; the peduncle is about a yard long, the spathe is glaucous-green tinged with red and the flowers are of a bright orange colour, the conspicuous arrow-shaped fused petals being violet-blue. Both the parent species are also in flower in the same house. The hybrid has been named *S. kewensis*.

The dimensions of the flowers are as follows:—

	S. augusta	*S. Reginae*	*S. kewensis*
Sepals length ...	6½ ins.	4½ ins.	5 ins.
Petals „ ...	4¾ „	3½ „	3¾ ins.

The general appearance of the flower in *S. kewensis* resembles that of *S. Reginae* more closely than that of *S. augusta*. The stamens are enclosed in the fused petal-sheath in the hybrid and in *S. Reginae* but are exposed in *S. augusta*. The small hooded petal of the hybrid, however, is much more like that of *S. augusta* and it is also interesting to notice that the lilac-pink patches at the base of the sepals in *S. augusta* are also present in a similar position in the hybrid.

Agave Elemeetiana.—A fine example of this species has been flowering during the past few weeks in the succulent house. The spike, which reaches to the roof, is about 15 feet in length and, with the exception of the lower two feet, is densely crowded with flowers.

From an estimate there would appear to be about 3,150 flowers on the spike.

According to Mr. Baker this plant is a native of Mexico. It was introduced about 1864 and named in compliment to Mr. de Jonge Van Elemeet, of Overduin, in Zealand, the companion and biographer of General Von Jacobi and the owner of a remarkable collection of Agaves. It was flowered in 1867 by Mr. Saunders, and a coloured figure appeared in the *Refugium*. It is now widely spread in collections and flowered at Kew in 1874, 1877, and again in 1883. It is monocarpic, dying after flowering, like its near ally *A. attenuata*, and is a most distinct and unmistakable species.

Presentations to the Library during 1909.—The Bentham Trustees have again come to the assistance of the establishment by making

purchases of books for the library. Through their liberality a good copy of Redoute's fine work, the *Choix des plus belles fleurs*, has been acquired. It appears to be very scarce, especially in a complete state. In 1892 a copy was offered by a London bookseller for £20, and ten years later another was sold by auction by Messrs. Sotheby, Wilkinson and Hodge for £31. Pritzel and some other bibliographers state that the work, which was published in Paris between 1827 and 1833, contains 144 plates, while another gives the number as 143. The Kew copy contains 145.

From the same source has been received an excellent copy of the first edition (Paris, 1553) of *Les observations de plusieurs singularitez et choses memorables trouvées en Greece, Asie*, &c., by Pierre Belon, a small quarto of 210 folios, with numerous illustrations in the text. There were several other French editions between 1554 and 1588, and in 1589 a Latin translation by Clusius was published in Antwerp. It may be remarked that the portrait of Belon and the illustration of Mount Sinai, which are present in the 1555 edition, are both absent from the first edition, though according to Pritzel's collation this edition should contain the portrait.

The Bentham Trustees have also presented a set of the *Bulletins du cercle professoral pour le progrès de l'Arboriculture en Belgique* or, as they were afterwards called, *Bulletins d'Arboriculture, de Culture potagère et de Floriculture*. This publication was edited by F. Burvenich, Ed. Pynaert, and others, and was first issued in 1865. The Kew set comprises 39 volumes, extending to 1905. The work is chiefly of interest to the horticulturist, and especially to the pomologist. Among other presentations by the Bentham Trustees are two copies of the fourth volume of Elwes and Henry's *Trees of Great Britain and Ireland*, and the sixth (and last) series of Boudier's *Icones Mycologicae*.

Sir Frank Crisp, J.P., F.L.S., has presented the *Cyclopedia of American Agriculture*, edited by L. H. Bailey, in four large octavo volumes; *La flore alpine*, Genève [1908?], by H. Correvon and P. Robert, and *Planting and Ornamental Gardening*, London, 1785, a work attributed to William Marshall.

Dr. N. L. Britton, Director-in-Chief of the New York Botanical Garden, has been for many years a liberal contributor to the library. During last autumn he sent to Kew a very large collection of the publications of the various United States Agricultural Experiment Stations, excluding those of the United States Department of Agriculture. Of these 1,064 have been selected for the library. They are indexed in that extremely useful publication, *The Experiment Station Record*, published by the United States Department of Agriculture, which, with selections of the copious literature issued by that department, is regularly sent to Kew through the kindness of the Secretary of Agriculture, Washington.

During the year two more parts of the *North American Flora*, the colossal work which is being published by the New York Botanical Garden, were presented by Dr. Britton from whom nine parts had previously been received. According to the present design the Flora will comprise thirty-two large octavo volumes.

Dr. W. L. Jepson has commenced the publication of his *Flora of California* and has presented to the library the two parts issued, which include Pinaceae to Taxaceae and Salicaceae to Urticaceae.

The *Flora der Schweiz* of Prof. Hans Schinz and Prof. R. Keller has reached its third edition, the first part of which was published in 1909 and was presented by Prof. Schinz, who has also, as in former years, sent to Kew the botanical publications of the University of Zurich.

Many efforts have been made during the last fifteen years to complete the supplementary volumes to the first edition of Sowerby and Smith's *English Botany*, the last two (iv. and v.) of which were very imperfect. In 1903 the late Dr. M. T. Masters completed vol. iv. by presenting plates 2,912 to 2,960, with text and index. The last volume was left incomplete by the publishers and only four or five parts were issued, the last ending with plate 2,998 and letter-press for plate 2,999, which was never engraved. Kew possessed only a small portion of the fifth volume and this had been presented by Messrs. Dulau and Co. Through the kindness of Messrs. W. Wesley and Son this volume has now been completed as far as possible.

The voluminous manuscripts on the Cyperaceae by the late Mr. C. B. Clarke have been presented by his Executors. They consist of 11,722 narrow sheets written in the well-known small neat style, often with pen-and-ink sketches in the margin. They have been bound in thirty-one volumes. There are in addition many thousands of references to Cyperaceae written on small slips. These have been pasted down in six thick folio volumes. Two copies of the *Illustrations of Cyperaceae*, about which particulars are given in the *Kew Bulletin*, 1909, p. 280, have been received, one from Mr. G. Massee and the other from the publishers, Messrs. Williams and Norgate.

A few only of the numerous additions to the library made by presentation during the year are mentioned in the foregoing note. The detailed list of accessions is in preparation and will form Appendix ii. to the current volume of the *Kew Bulletin*.

S. A. S.

Botanical Magazine for February.—The plants figured are *Coelogyne Mooreana*, Sander, (t. 8297); *Populus nigra*, Linn., var. *betulifolia*, Torrey, (t. 8298); *Campanula Beauverdiana*, Fomin, (t. 8299); *Rhododendron Keiskei*, Miq., (t. 8300); and *Agonis marginata*, Schau., (t. 8301).

The *Coelogyne* is a recent introduction from Annam, where it was collected for Messrs. Sander & Sons, of St. Albans, by Mr. Micholitz. It flowered at St. Albans for the first time in December, 1906, and simultaneously at the Royal Botanic Garden, Glasnevin, whence the material figured was obtained. The Kew plant, which was presented by Messrs. Sander, has not yet flowered. The species is allied to *C. cristata*, Lindl., differing in having longer leaves, taller scapes, deciduous bracts and smaller flowers. *Populus nigra*, var. *betulifolia*, is an elegant form of the Black Poplar, which, for a century or more, has been cultivated in this

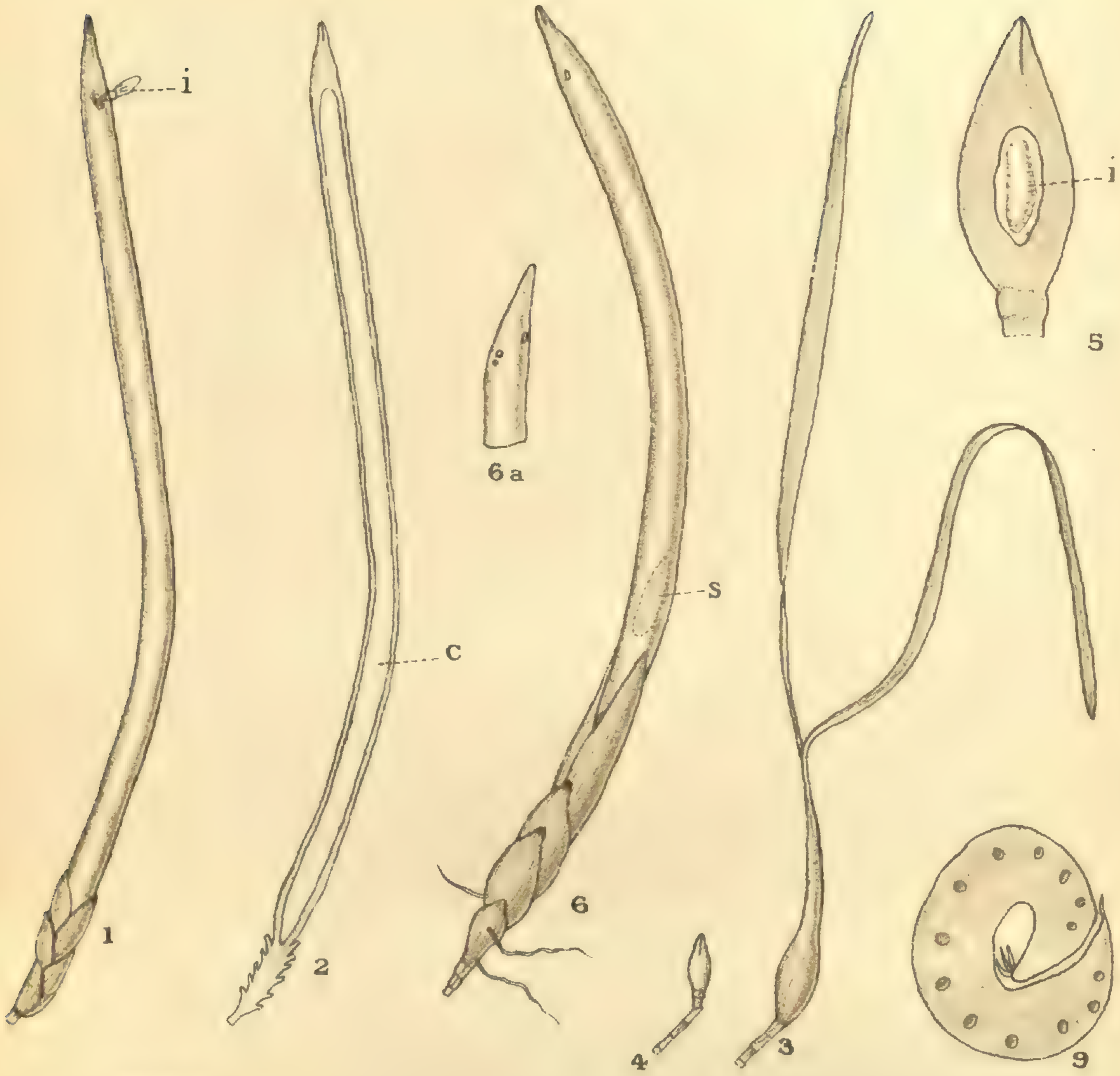
country and is sometimes met with in remarkably fine specimens, which have an Elm-like appearance. It is more ornamental than the type, and moreover differs from it in having more or less pubescent young branches and petioles. This interesting tree was first described by the younger Michaux as *Populus hudsonica* and shortly after by Pursh as *P. betulifolia*, from specimens found growing on the Hudson River and about Lake Ontario, where it had apparently been introduced, almost certainly from Europe. The *Campanula* is a native of Transcaucasia and Northern Persia, and the plant figured was raised at Kew from seed received from the Botanic Garden, Tiflis, Caucasus. It has pale blue, broad, campanulate flowers about $1\frac{1}{4}$ in. across. *Rhododendron Keiskei* is a Japanese species with rather small greenish-yellow flowers in clusters of 3 to 5. The illustration was prepared from a plant which was procured from a Yokohama nursery in 1908. *Agonis marginata* is a pretty myrtaceous shrub from Western Australia which has been figured from a specimen grown in the open in the garden of Mr. T. A. Dorrien Smith, Tresco Abbey, Isles of Scilly.

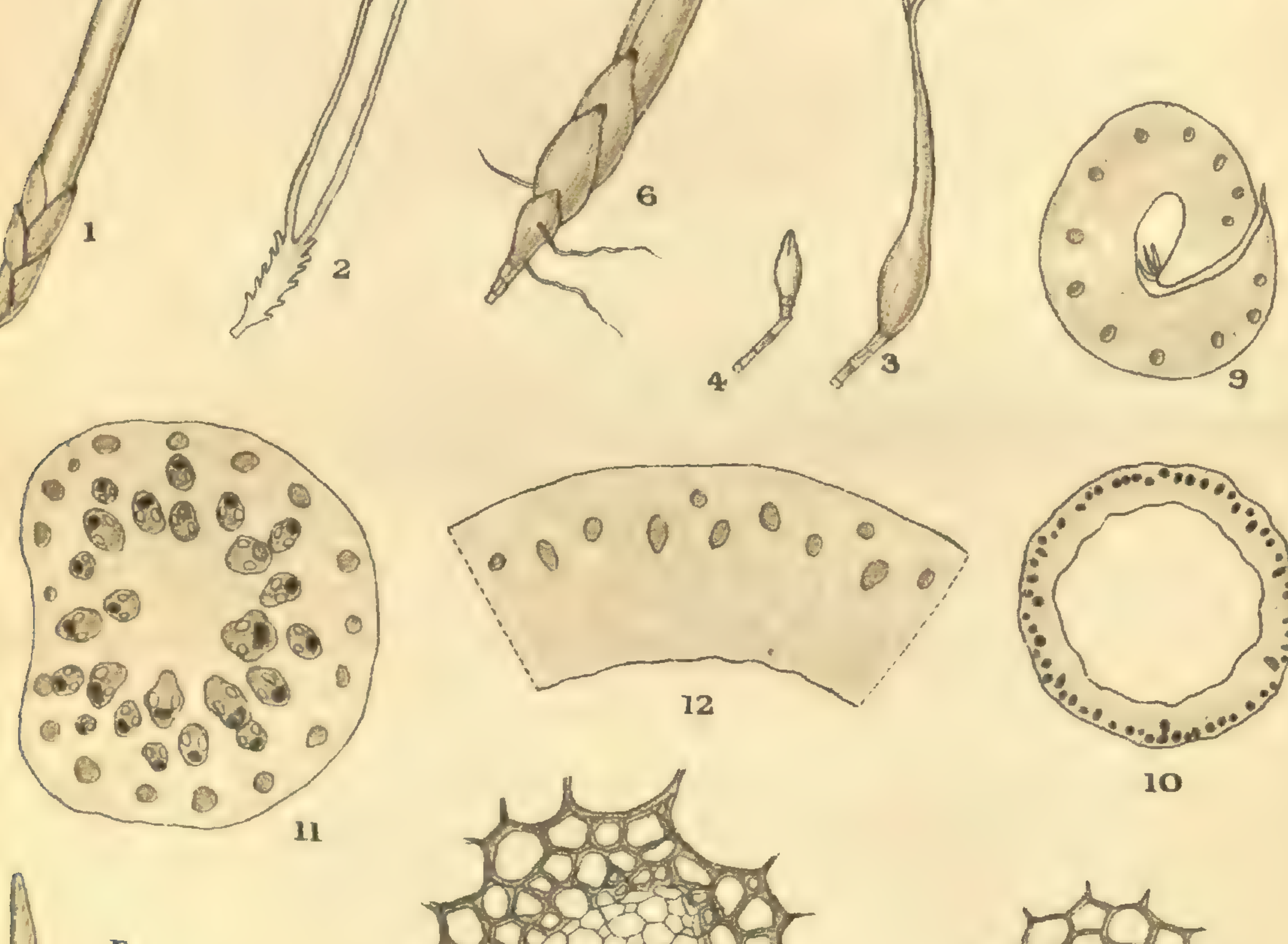
Witches' Brooms of Cacao.—Under the above title, an abstract was given in the *Bulletin*, 1909, p. 223, of an investigation conducted by Dr. C. J. J. van Hall, Inspector of Agriculture in Dutch Guiana, and Mr. A. W. Drost, who not only indicated the cause of the formation of Witches' brooms on the cacao plant, but also the origin of the diseases attacking the pods of the same plant. An English translation of this important paper, accompanied by the illustrations present in the original, has just appeared in the "Proceedings of the Agricultural Society of Trinidad and Tobago," vol. ix., December, 1909, pp. 475–562. The following points in connection with preventive measures were not included in the previous abstract in the *Bulletin*.

So far as has been ascertained, the fungus causing Witches' brooms and the pod disease, is confined to the cacao plant. Most success is to be expected from treatment by which the parasite is directly attacked. Considering the great number of Witches' brooms, hardened pods and infected cushions which a diseased tree bears, a removal of the entire leaf-bearing crowns of the tree becomes imperative, so that after all the leaf-bearing branches are cut off, nothing remains but the trunk and leafless main branches. After this operation the tree should be thoroughly sprayed with a three per cent solution of sulphate of copper. Trees thus treated form new crowns in a surprisingly short time. Cutting back should be done at the commencement of the principal dry season of the locality.

To ensure success cutting back should be conducted simultaneously over as large an area as possible. All pruned branches should be promptly burned.

G. M.





Galls of Ischaemum pilosum.

Waller & Graham, Ltd., Lithos, London.

[To face page 69.]

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1910.

XII.—GALLS ON AN INDIAN GRASS.

(With Plate.)

L. A. Boodle.

Some interesting specimens of a grass were sent to Kew in 1908 by Mr. W. A. Talbot, F.L.S., Conservator of Forests, Bombay. The specimens are portions of plants of *Ischaemum pilosum*, Hack., and the peculiar feature about them is the presence of upright leafless branches of a rather striking appearance.

Mr. Talbot, who was inclined to regard these specialised branches as pneumatophores, forwarded a number of specimens to Kew for further examination, with some notes giving his own observations on their appearance and occurrence.

An examination of these specimens has proved that the modified branches are really galls, the formation of which depends on the presence of a gall-insect. The material shows the nature and mode of formation of the gall, but does not include enough stages to render a complete account possible. It is to be hoped, therefore, that Mr. Talbot will be able to make further observations on the living plants, and to obtain a fuller history of the gall and the insect than can be given at present.

Before describing my own observations on the structure of the galls, it will be useful to make some extracts from Mr. Talbot's notes :—

"*Ischaemum pilosum*, Hack., a widely distributed species throughout the Deccan peninsula, Central Provinces, and other parts of the dry Indian region, grows, as far as I know, on all kinds of soil, and is particularly common on the Deccan Regur, which overlies the Trap, and in which it develops an extensive perennial underground system. The rhizomes are long, tough and wiry, somewhat resembling whipcord in appearance, and ramify below the surface of the ground, sometimes as deep down as 18 inches or 2 feet."

The Deccan Regur is described as a "hygroscopic plastic black soil, which contracts and expands in a remarkable degree under different conditions of moisture and dryness. After the first showers in June, when the hot season is over, the deep gaping fissures, which divide up the black soil into irregular masses, close, and the whole is converted into a highly plastic and impermeable

(15747—6a.) Wt. 92—428. 1375. 4/10. D & S.

mass." It was partly on account of this character of the soil that Mr. Talbot was led to regard the specialised branches as pneumatophores.

The galls of *Ischaemum pilosum* are described by Mr. Talbot as "peculiar, red-coloured axile organs,* clothed with sheathing white scales at the base, and somewhat resembling slender goose-quills in shape and thickness . . . They are conspicuous objects during June, July and August, when the rainfall in the Deccan is heaviest, on the black soil about Poona."

The mature gall may be described as a cylindrical tube, pointed at the apex, and sheathed at the base by scale-leaves (Fig. 1). Its length, in the specimens sent to Kew, varied from 11 to 18 cm., and its diameter from 3 to 4 mm. The pointed tip of the gall consists of an indurated, rolled leaf-rudiment, 1–2 mm. in length,† beneath which is a short solid portion of stem, or diaphragm. The hollow portion extends from this diaphragm to the insertion of the highest scale-leaf, *i.e.*, for practically the whole length of the gall, and thus represents a single greatly elongated internode. A longitudinal section of the gall is shown in Fig. 2.

In the mature gall the internodal cavity is empty, but there is a small hole near the top, *i.e.*, just below the diaphragm. This hole has evidently been made by the gall-insect for its escape, and, in several specimens, part of the pupal skin of the insect was found wedged in this aperture and protruding from it (Fig. 1, *i*.).

Prof. J. W. H. Trail, F.R.S., to whom I am much indebted for information on several points relating to the formation of galls, kindly examined the pupal skins, and found their structure to indicate that they belong to one of the Cecidomyidae. The pupal skins bear small spines directed backwards, and it must be with the aid of these spines that the insect wriggles its way to the top of the gall.

The origin of the gall appears to be as follows : The larva of the gall-insect finds its way into the meristematic tissue of the stem immediately below the youngest leaf-rudiment of the bud,‡ with the final result that the youngest leaf remains rudimentary, that no further apical growth takes place, and that the highest internode becomes hollow, and also abnormally elongated owing to long-continued intercalary growth at its base. Comparison with a normal branch shows that the internodes of the stem, at a level corresponding to that of the gall, are solid, only 4–5 mm. in length, and have the vascular bundles scattered over the greater part of the transverse section (Fig. 11), while in the gall-internode the bundles show an approximation to arrangement in a single circle (Fig. 10 and Fig. 12, which is a portion of a transverse section of a gall enlarged to the same scale as Fig. 11). The vascular bundles in the gall

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* The specimens were sent in spirit, and consequently the colouring matter had been extracted.

† In Fig. 1 the length of the leaf-rudiment is shown by the longitudinal line or slit at the apex ; this line, which may be inconspicuous, indicates the outer margin of the rolled leaf.

‡ It is assumed that the larva bores its way into the tissue of the stem, because, as Prof. Trail informs me, the ovipositor of the female Cecidomyid is usually not strong enough to bore into plant-tissues. Possibly, however, this particular insect may form an exception.

are more numerous, and on the average smaller than in the normal internode. They also differ somewhat in structure, as will be described below. Thus the presence of the insect, in the successive stages of larva and pupa, causes considerable modifications in the structure and development of the internode, the most striking feature being the excessive intercalary growth of the gall. The latter may attain a length of more than thirty times that of the normal internode.

Among the material examined there were a few galls in an early stage. It is probable that they would have developed into mature structures like those described above, but with the difference that the leaves immediately sheathing the base of the gall were not scale-like, but had developed a lamina. This difference is presumably due to the bud having been attacked at a slightly different stage. A branch with one of these young galls is shown in Fig. 3. This specimen is only distinguished from a normal branch by the slight swelling near the base. On removing the leaves, the swollen internode is seen surmounted by the youngest leaf-rudiment (Fig. 4). The insect, which is in the larval stage, nearly fills the internal cavity of the gall, as is seen in the enlarged longitudinal section (Fig. 5).

Specimens of this larva, and of the pupal skins from mature galls, were sent to Prof. J. J. Kieffer, who kindly examined them, and wrote the following description for publication.

"*Oligotrophus ischaemi*, sp. nov.—Larve blanche, longue de 2 mm., lisse ; verrues spiniformes très fines, situées sur la partie ventrale des deux derniers segments thoraciques et de tous les segments abdominaux ; toutes les papilles sont simples, sauf les huit terminales, qui sont pourvues d'une soie très courte et peu distincte; papilles pleurales et sternales assez grandes, les pleurales internes disposées par groupes de trois ; papilles ventrales antérieures et postérieures petites et peu apparentes. Segment anal arrondi, légèrement échancré au milieu ; sa partie dorsale porte, à sa base, quelques granulations éparses, et dans sa moitié postérieure, des téguments subplans.

"Spatule jaune, grande, sessile, aussi longue que large, munie en avant, de deux dents triangulaires qui sont deux fois aussi longues que larges à leur base, et séparées l'une de l'autre par une incision largement arquée. Nymphe à peau hyaline ; spinules dorsales fortes, jaunes, disposées en 3 à 4 rangées ; stigmates thoraciques 3 à 4 fois aussi longs que gros, cylindriques et épais."

With regard to the generic determination Prof. Kieffer adds :—

"Le genre *Oligotrophus* est voisin de *Mayetiola* ; si la pupe est une coque brune, l'insecte serait un *Mayetiola*, quoique tous les *Mayetiola* connus aient la peau couverte de téguments et non lisse, à l'état larvaire."

Among the mature galls one exceptional case was met with (Fig. 6). The gall was of the usual type except that there were three small holes (Fig. 6*a*), instead of the single rather larger one, and also the gall was not empty, but contained, as Prof. Kieffer determined, a distended skin (of the gall-insect) inhabited by specimens of a parasitic insect belonging to the genus *Platygaster* (Fig. 6, *s*.). The gall-insect had clearly been killed by the

parasites, some of which had escaped by the three holes referred to above, while three mature insects were still to be seen within the skin of the gall-insect.

A younger gall (Fig. 7) appears to be another example of the same kind. The body inside this gall (Fig. 8, *i*.) is described by Prof. Kieffer as a skin containing larvae of parasitic Hymenoptera. These may well belong to the same species as the parasitic insects mentioned in the last case. It is interesting to find that the position of the puncture, marking the point of entry of the larva of the gall insect,* can be seen in this specimen. In the uppermost sheathing leaf there is a small hole (Fig. 7, *p*.), and in the enclosed hollow internode there is a small tuft of hairs (Fig. 8, *h*.). This no doubt marks the point of puncture ; the tissue, being meristematic at the time, closed up again, but the irritation involved has caused the formation of a patch of hairs on the otherwise glabrous internode of the gall. The elongation of the leaf had been greater than that of the gall-internode, so that the hole in the former and the hairs on the latter were not opposite one another, though in the same vertical line.

A transverse section of the leaf-rudiment from the apex of a normal mature gall is shown diagrammatically in Fig. 9. The parenchymatous cells of the mesophyll have thick walls and are practically devoid of contents ; the vascular bundles are collateral.

The structural difference between the vascular bundles of the normal internode and those of the gall is shown in Figs. 13 and 14. A medium-sized bundle was chosen for illustration in both cases. The bundle from the gall (Fig. 14) shows considerable reduction in the size of the xylem-vessels and the elements of the phloem. This reduction in the size of the conducting elements of the vascular bundles is a marked feature in all the galls examined, and, in the case of the vessels, may be carried further than in Fig. 14, even in the largest bundles of a gall. This reduction may perhaps be connected with the rudimentary nature of the single leaf above the gall and the cessation of apical growth.

Prof. Trail informs me that he has found a somewhat similar gall in *Agropyrum repens*,† but that certain characters of the gall in *Ischaemum* and of the insect producing it are exceptional. Thus the great elongation of the internode is unusual, since Houard,‡ in referring generally to terminal stem-galls in the grasses, states that, in consequence of the presence of a larva in the medullary tissue, the elongation of the upper internodes does not take place. The insect also is of an unusually large size for a member of the Cecidomyidae. The pupal skin, though incomplete and curtailed in length, when found attached to the mature gall of *Ischaemum*, may measure 6 mm.

The foregoing account will serve to show that the galls of *Ischaemum* present several interesting features, and should repay a further study.

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* Or possibly a perforation made by the ovipositor of the parasitic insect. On the other hand the egg of the parasite may be laid on the larva of the gall-insect while it is still outside the stem.

† *Cf.* Houard, Ann. Sci. Nat. Bot., sér. 8, p. 360, t. 20.

‡ Houard, Les Zoocécidies des Plantes d'Europe (1908), vol. 1, p. 59.

Ischaemum pilosum appears to have some economic importance, since Watt* states that it is "considered a good fodder grass in the Nimar district." The gall-insect probably does no great amount of damage, as Mr. Talbot writes that the galls are not found on plants growing in porous soils, and that, where the galls occur, they are somewhat sparsely distributed.

Explanation of Plate.

All the figures are of *Ischaemum pilosum*.

Fig. 1.—External view of mature gall showing sheathing scale-leaves at the base and the pupal skin of the gall-insect (*i.*) sticking out of a hole near the apex of the gall. Nat. size.

Fig. 2.—Longitudinal section of the same gall showing the extent of the cavity (*c.*). Nat. size.

Fig. 3.—Branch bearing two well-developed leaves and a young gall enclosed in the leaf-bases. Nat. size.

Fig. 4.—The same after the removal of the leaves. Nat. size.

Fig. 5.—The same gall cut longitudinally and enlarged, showing the larva (*i.*) in the cavity. × 5.

Fig. 6.—Gall containing skin of gall-insect with parasites. The position of the skin is shown at *s*. Nat. size.

Fig. 6*a*.—Upper part of same gall seen from the left side to show the three small holes. Nat. size.

Fig. 7.—Young gall covered by its sheathing leaves; *p*. puncture in upper leaf. Nat. size.

Fig. 8.—The same after removal of the leaves; *h*. group of hairs; *i*. skin of gall-insect containing parasitic larvae; at *b*. the tissues of the gall are mature, at *a*. they are meristematic. Nat. size.

Fig. 9.—Transverse section of leaf-rudiment from the apex of a mature gall. × 30.

Fig. 10.—Transverse section of a mature gall near the middle of its length. × 8.

Fig. 11.—Transverse section of normal internode. × 30.

Fig. 12.—Portion of transverse section of a gall. × 30.

Fig. 13.—Transverse section of vascular bundle of normal internode. × 305.

Fig. 14.—Transverse section of vascular bundle of gall. × 305.

XIII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LVI.

551. **Corydalis spathulata**, *Prain MSS. in Herb. Calcutta, ex Craib* [Papaveraceae-Fumarieae]; ad *C. mucroniferam*, Maxim., et *C. Boweri*, Hemsl., habitu accedit sed bracteis ovularumque numero differt.

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* Watt, Dict. Econ. Prod. India.

Herba pusilla, caespitosa, 2–4·5 cm. alta, omnino glabra. *Radix* tenuis, fusiformis, elongatus, circiter 2 mm. latus. *Caulis* dense ramosus, ramulis diffusis dense caespitosis. *Folia* radicalia longe petiolata, petiolo 2–5 cm. longo ; lamina 0·8–1·5 cm. longa, 0·7–1 cm. lata, crassa, spathulata, pinnatim 3–5-secta, segmentis subsessilibus late orbiculatis 3-fidis, lobulis obovatis, imbricatis, distincte mucronatis, nervis obscuris. *Racemi* immersi. *Bracteae* foliosae, ambitu obovatae, trisectae, circiter 1 cm. longae, basi 1 mm. latae ; segmentum intermedium simplex, lineari-spathulatum, apiculatum, lateralia eodem modo trisecta nisi segmentulis lateralibus interdum inciso-serratis. *Flores* minuti, 7–8 mm. longi, calcari obtuso 2–3 mm. longo, pedicello circiter 6 mm. longo. *Sepala* persistentia, minuta, elliptica, antice irregulariter paucidentata. *Petalum* inferius cochleariforme, lateralibus spathulatis. *Staminum* adelphii infra medium subito dilatati. *Ovarium* ellipsoideum, 9-ovulatum, stylo 4 mm. longo stamina aequante. *Stigma* 3-lobatum crenatumque. *Capsula* pedicello arcte recurvo insidens oblonga, 1·5–2 mm. alta, circiter 1 mm. lata, saepissime 4–5-sperma, stylo persistente arcte recurvo coronata. *Semina* nigra, nitida, reniformia, circiter 1·5 mm. lata, 1 mm. alta.

Tibet. Gyantse, *H. J. Walton* ; Numa, *H. M. Stewart*.

552. **Impatiens Hubertii**, *Hk. f.* [Geraniaceae - Balsamineae] ; affinis *I. Blumei*, Zoll. et Mor., sed petiolis 1–3 cm. longis et seminibus laevibus 1·5 mm. longis differt.

Herba gracilis, erecta, ± 7·5 cm. alta, fere glaberrima, parviflora, caule basi repente parce ramoso, ramulis novellis puberulis. *Folia* 3–5 cm. longa, petiolata, ternatim verticillata, firma, ovata vel rotundata, acuta, minute spinuloso-serrulata, basi acuta, subtus pallida, nervis utrinque 5–6, petiolo gracillimo 1–3 cm. longo ; glandulae infrapetiolares minutae, setaceae. *Inflorescentia* simpliciter pedicellata ; pedicelli in axillis foliorum solitarii, foliis subaequilongi, graciles, erecti. *Flores* ad 1·5 cm. expansi, albi. *Sepala* 2, ovata, acuminata, 6–7 mm. longa, 3–5-nervia. *Vexillum* oblate trigonum, angulis rotundatis, 12 mm. latum, costa dorso carinata, carina medio incrassata, apiculata. *Alae* sessiles, 12–14 mm. longae ; lobus basalis obovato-oblongus, apice retusus ; distalis duplo major, late obcordatus ; auricula dorsalis obscura. *Labelli* limbus scaphiformis, ascendens, fere erectus, ovatus, acuminatus, 6–10 mm. longus ; calcar gracillimum, pendulum, 3–3·5 mm. longum. *Filamenta* brevia, subulata ; antherae minutae, connatae. *Ovarium* ovoideum, obtusum. *Capsulae* 12–13 mm. longae, anguste ovoideae, fere rectae, vix stipitatae, obtuse rostratae, polyspermae. *Semina* minima, 1·5 mm. longa, pyriformia, compressa, laevia, atra.

Borneo austro-orient. Inter Kumam et Slinau, *H. Winkler*, 2939.

I. Huberti is most nearly allied to *I. Blumei*, Zoll. & Mor., from Java, a much smaller flaccid species, with shortly petioled leaves and pilose seeds nearly twice as large.

553. **Impatiens orthosepala**, *Hk. f.* [Geraniaceae - Balsamineae] ; affinis *I. Hubertii*, Hk. f., sed vexilli magnitudine et sepalorum forma valde diversa.

Herba erecta, gracilis, glaberrima, parviflora, caule ramoso rigido, ramis ramulisque erectis. *Folia* 4–5 cm. longa, opposita et

alterna, petiolata, firma, ovata, acuminata, spinuloso-serrulata, subtus pallida, basi breviter in petiolum gracilem 1–3 cm. longum angustata, nervis utrinque 3–4 ; glandulae infrapetiolares minimae, setaceae vel 0. *Inflorescentia* simpliciter pedicellata ; pedicelli foliis subaequilongi, solitarii, gracillimi. *Flores* ad 2 cm. expansi, lilacini. *Sepala* 8–11 mm. longa, anguste ovato-lanceolata, longe acuminata, striata, 5-nervia. *Vexillum* magnum, oblate trigonum angulis rotundatis, 12 mm. latum, costa dorso tenue apiculata medio paullo incrassata. *Alae* sessiles, 12 mm. longae ; lobus basalis obovato-oblongus, apice retusus vel subbilobus, distalis triplo major, late obcordatus ; auricula dorsalis 0. *Labelli* limbus scaphiformis, lanceolatus, fere erectus, acuminatus, 1–1·2 cm. longus ; calcar gracillimum, 4–4·5 cm. longum, dependens.

Borneo austro-orient. Inter Tarik austral. et Kwaru, secus ripas rivulorum, *H. Winkler*, 3050.

The specimens described are scanty and imperfect, but the species is so distinct from any known to me that I have not hesitated to describe it. It is clearly closely allied to *I. Hubertii*, with which it precisely accords in the form of the wings, but in the size of the vexillum and form of the sepals they widely differ.

554. **Impatiens Winkleri**, *Hk. f.* [Geraniaceae-Balsamineae] ; inter omnes species ex insulis Malayicis hucusque notas lobis alae distalibus plus minusve connatis distincta.

Herba humilis, robusta, glaberrima, floribus mediocribus, caule plus minusve 1 m. alto simplice 2–3 cm. crasso carnoso. *Folia* ampla, 1–1·3 cm. longa, alterna, petiolata, exsiccata membranacea, late ovata, cuspidata, minute serrulata, basi acuta, nervis utrinque 10–15, petiolo crasso 6–10 cm. longo ; glandulae infrapetiolares 0 ? *Inflorescentia* simpliciter pedicellata ; pedicelli solitarii, graciles, 1–2 cm. longi, fructiferi 2–3-plo longiores. *Flores* ad 3 cm. expansi, rosei brunneo-punctati. *Sepala* 2, orbicularia, cuspidata, membranacea, reticulatim multinervia, 1·2 cm. diametro. *Vexillum* oblongum, 1·4 cm. longum, recurvum, basi et apice rotundatum, costa dorso anguste alata, ala apice truncata. *Alae* sessiles, 2 cm. longae ; lobi basales liberi, falcatim obovati, distales basalibus aequilongi, late dolabriformes vel semilunares, apicem versus repente angustati ; auriculae dorsales connatae. *Labelli* limbus 1·7 cm. longus, cymbiformis, horizontalis, acuminatus; calcar limbo multo brevius, incurvum, crassum, apice bifidum. *Filamenta* brevia, linearia ; antherae parvae, in capitulum decurvum connatae. *Ovarium* angustum, apice acuminatum incurvum. *Capsula* parva, 12 mm. longa, anguste ellipsoidea, longe stipitata et rostrata, rostro recto pugioniforme, oligosperma. *Semina* 2·5–3 mm. longa, oblonga, pilis inarticulatis hirsuta.

Borneo austro-orient. Inter Batu Babi et Lumovia, *H. Winkler*, 2866.

I. dempoana, Hk. f. ined., of Sumatra, and *I. Winkleri* are the only species of about 55 known to me as native of the Malayan Archipelago (extending from Sumatra to the Philippine Islands) in which the distal lobes of the wings are more or less connate, a character common to many Indo-Chinese and a few Malay Peninsula species.

Dr. Winkler describes the flowers as white, the four lobes of the lower lip (alae) as rose-coloured with brown dots along the inner margin, and the central crest (vexillum ?) as yellow.

555. **Anaphalis deserti**, *J. R. Drummond* [Compositae-Inuloideae-Gnaphalinae] ; e grege *A. Hookeri*, cum *A. subumbellata* et *A. araneosa* comparabilis ; ab *A. Hookeri*, *A. subumbellata* et *A. xylorrhiza*, praeter alia signa, foliorum basi decurrente,—ab *A. araneosa* (inclusa *A. semidecurrente*, Wall.) ob phyllaria sensim attenuata et inflorescentiam compactam distincta.

Herba perennis pedalis vel sesquipedalis. *Caules* 2–4 e rhizomate procumbente ligneo gemmifero ascendentes sarmentosi, tenues, teretes, castanei coloris. *Folia* oblongo-linearia apice rotundata, margine plana, uninervia, superiore pagina atroviridi glabrescente, inferiore cinereo-puberula, ad 5 cm. longa, 5 mm. lata, anguste decurrentia, sub capitula araneosa. *Capitula* parva, in glomerulos folia superna vix supereminantes ad 15–20 conferta, flavescentia. *Phyllaria* exteriora fulva, obovata, circa 7 mm. longa, interiora albo-nitida sub-pellucida ovato-lanceolata obtuse acuminata, omnia sensim attenuata, scariosa. *Achaenia* minutissima, sub-cylindrica, supra sparse glandulosa, infra obscure costata, pappo multo longiore albescente scabro uniseriato libero coronata.

India. Eastern Himalaya : Lonok, *Younghusband*. Tibet. Near Gyantse, *Stewart*.

556. **Leontopodium fimbrilligerum**, *J. R. Drummond* [Compositae-Inuloideae-Gnaphalinae] ; ab omnibus speciebus *Leontopodii* adhuc descriptis propter pappum antenniformem bene distinctum, et ita *Antennariis* vel quibusdam speciebus *Gnaphalii* approximans, sed habitu et capituli structura manifeste congener *Leontopodii alpini*, a quo phyllariis interioribus margine laceris apice fimbrilligeris statim discernitur.

Herba spithamea, caespitosa, (dioica ?), rhizomate perenni intricate ramoso castaneo tenaci caules plures foliosas pseudo-monocephalas edente. *Folia* radicalia subverticillata, 12 mm. vel plus longa, lineari-spathulata, sub apicem obtusiusculam lente dilatata, dense lanata, caulina consimilia sessilia subremota, involucralia iis longiora, acutiora, capillis longis sericeo-villosis demum fulvescentibus copiose vestita. *Capitula* [♀ visa tantum ?] subconica, exigua, pauciflora, villosa, quinque vel plura super receptaculum commune plano-convexum circa 7·5 mm. latum glomerata. *Phyllaria* exteriora villis laxis fulvescentibus celata, interiora oblanceolata, scariosa, sub-purpurea, intus glabrescentia, margine lacere pinnatifido, apice fimbriato. *Flosculi* subtruncati, fusci. *Pappi* setae basi liberae, barbellatae, versus apicem clavatae (antenniformes), flosculos superantes. *Fructus* non visi.

India. Eastern Himalaya : Chumbi valley, at about 3350 m., *King's collector*.

The above description follows so far as possible a MS. note by the late Sir George King, who adds : "this has the general facies of *L. alpinum*, but is readily distinguished by the yellow involucral leaves and by the fimbriate involucral scales." In habit the plant is a *Leontopodium*, but the clavate toothed pappus-hairs recall *Antennaria* or certain species of *Anaphalis*. Their insertion is

peculiar, seeming to be partly at least at the base of the corolla-tube, but the material is imperfect ; and for the same reason it cannot be said whether the sexes are completely diclinous.

The specific name refers to the very remarkable structure of the phyllaries, which is quite unlike that in any known species of *Leontopodium*, except the next, though having analogies in *Gnaphalium*.

557. **Leontopodium paradoxum**, *J. R. Drummond* [Compositae-Inuloideae-Gnaphalinae] ; species nulli *Leontopodii* speciei arcte affinis, habitu nonullas species *Filaginis* revocans, ob pappum omnino liberum in eadem sectione cum praecedente locanda, et, praeter illam, ab omnibus *Leontopodiis* eodem charactere distinguenda.

Herba nana vel procumbens, subcaespitosa, (dioica ?), rhizomate perenni ligneo-fibroso in caules 2 vel plures sarmentosos, infra denudatos, superne saepius arcuatos et lanatos, capitulorum glomeris seu foliorum verticillis terminatos subito diviso. *Folia* radicalia pauca vel omnino absentia, sparsa vel rosulatim (internodis abbreviatis) congesta, margine integro vix undulato, ex angusta basi sessili lineari-spathulata, apice obtusiusculo, nervo unico ex inferiori pagina eminente, utrinque candide appresse lanata, circa 12·5 mm. longa, vix 4 mm. lata, involucralia longiora, ovata, et acutiora, superiore pagina villis candidis vel demum fulvescentibus laxe intertextis quasi incunabulum conformantibus copiose munita. *Capitula* [♂ tantum in speciminibus hodiernis visa ?] exigua, subcylindrica, pauciflora, glabra, quatuor vel plura super incunabulum circa 12·5 mm. latum laxe disposita ; receptaculum minutum umbonatum late alveolatum. *Phyllaria* quinque vel plura, glaberrima, basi angustata, supra late spathulata, ungue subpellucido atro-lineato arguto, limbo ample rotundato plus minus sub marginem lacerato sub-purpureo, demum stellulatim patentia ; [flosculi etc. in speciminibus hodiernis non visi]. *Pappi* setae liberae.

India. Eastern Himalaya : hill behind Tangu Bungalow, 4360 m., *Younghusband, T.* 51 ; Tangu 3660 m., *Prain*. Also collected (in Tibet) by *Col. Waddell*, and at Wallanchon (border of Nepal) by *Sir J. D. Hooker*.

Sir Joseph Hooker gave this plant the manuscript name of *Anaphalis sessiliflora*, with regard to the distinct pappus hairs ; but if the present specimens belong to the same species the genus should apparently be *Leontopodium*. He has observed (Fl. Brit. Ind. iii. 279), that in some species of *Anaphalis* the disk-flowers are all fertile, thus breaking down the character between this genus and *Gnaphalium*, and adds, "in fact the differences between these genera and *Helichrysum*, *Antennaria*, and *Leontopodium* are artificial, and hardly sufficient for practical purposes."

That characters mainly founded on the pappus are of less value than was formerly supposed in this group of *Inuloideae* appears certain, but the structure of the inflorescence is a sufficient mark for the very natural genus *Leontopodium*, of which several new forms, chiefly from E. Asia, have been recognised or added since the Compositae were described for the Fl. Brit. Ind. The habit of the present species is remote from nearly all the various types of

Anaphalis, most resembling that of some *Filagos*, while the heads are not unlike some species of *Gnaphalium* or *Micropus*; but the involucral leaves are essentially those of a *Leontopodium*.

Named with reference to the free pappus hairs, which are abnormal in the genus.

558. **Saussurea tanguensis**, *J. R. Drummond* [Compositae-Cynaroideae-Carduineae]; species singularis, nulli adhuc cognitae arctius affinis, approximans autem *S. Thomsoni*, C. B. Clarke, a quâ capitutis late hemisphaericis neque subglobosis, bracteis subcapitularibus basi subtruncatis, suprâ sensim acuminatis nec oblongo-rotundatis apice obtuse acuminatis, phyllariis obovato-lanceolatis acuminatis nec oblongis obtusis, pappo subrigido, scabro potius quam plumoso, nitide purpureo, nec albido, facile distinguitur.

Herba saepe nana, at nonnunquam elatior, rigida, caudiculis 1–4 robustis, ad 3–8 cm. longis, foliorum vetustorum petiolis vestitis ex rhizomate perenni sublignoso 10 cm. longitudinis attingente ortis. *Caules* annui e summis caudiculis ascendentes, foliosi, vel paucis foliis donati, subscaposi, aliquando ad 22 cm. producti, saepius abbreviati, vel fere deficientes, uniflori. *Folia* in caulis inferiore parte subcoriacea vel plus minus carnosa, 3–6 cm. longa, 5–10 mm. lata, spathulato-oblonga, inferiore parte in petiolum laminam subaequantem sensim attenuata, apice obtuso vel obtuse acuminato, margine remote denticulato, pilis glandulosis obscure conspersa vel fere glabra, supra modo bractearum quasi verticillata, et tunc ovato-lanceolata vix 15 mm. longa, capitulum plus minus arcte amplectentia, omnia minute rugosa, subflavide virescentia. *Phyllaria* lineari-oblonga, obtuse acuminata, pilis glandulosis satis sparse densius ad marginem obsita, flosculos subaequantia; capitulum diametro 3 cm. attingens. *Flosculi* tenuissimi, circa 8 mm. longi segmentulis abbreviatis, tubo supra albo-hispido, lobis stigmaticis exsertis. *Pappus* duplicatus fragilis, exteriore serie setis scabris brevioribus ferrugineis, interiore paucis flosculum vix aequantibus scabriusculis nitide purpureis, consistente: (achaenia curculionibus vastata, non sunt visa).

India. Eastern Himalaya: hill behind Tangu Bungalow, 4920 m., *Younghusband*; The La, 4600 m., *Smith* and *Cave*, 2161; Tongsong La valley, 5080 m., *Smith* and *Cave*, 2357.

A singular form unlike any other species save *S. Thomsoni*, C. B. Clarke, and some forms of *S. bracteata*, Decaisne, from both of which it differs in the structure of the head and colour of the pappus.

559. **Aristolochia Curtisii**, *King MSS. ex Gamble* [Aristolochiaceae]; species *A. hastatae*, Jack, sumatranae affinis; ob folia profunde triloba pedatim 7–9-costata distincta.

Frutex scandens, parvus; rami suberosi; ramuli sulcati, torti, glabri. *Folia* chartacea, glabra, juniora late hastata, ad 10 cm. longa, 16 cm. lata, adulta profunde digitatim triloba, basi cuneata, pedatim costata, 10–20 cm. longa, 10–30 cm. lata, lobo medio oblongo-lanceolato, acuminato, lateralibus spathulatis apice rotundatis incurvis, marginibus integris, costis lobi medii 3 centrali ad apicem attingenti, lateralibus submarginalibus, costis loborum lateralium 2 nervos paucos emittentibus, venis transveris multis reticulantibus; petiolus gracilis, canaliculatus, 5–10 cm.

longus. *Flores* in racemis 1–3 axillaribus conspicue bracteatis ad 5 cm. longis; rhachis angularis; bracteae amplexicaules, rufescentes, ovato-acuminatae, 1–1·5 cm. longae; flores cyanei et punicei. *Perianthium* 4–5 cm. longum, puberulum, basi oblongum, inflatum, inde cylindricum, ore bilabiatum, labio superiore parvo, inferiore elongato ad 2–2·5 cm. longo. *Stamina* 6, sessilia, styli columnae adnata; antherarum loculi distincti. *Stylus* in columnam brevissimam productus, in discum 6-lobum, 6-apiculatum desinens. *Capsula* oblonga, obtusa, 4 cm. longa, 6-costata, costis junioribus alatis.

Malay Peninsula. Penang: in dense forest, *Curtis*, 330; *G. King*; *Kunstler*, 1453.

560. **Aristolochia minutiflora**, *Ridley MSS. ex Gamble* [Aristolochiaceae]; species *A. indicae* et *A. Tagalae* affinis, sed floribus minoribus et fructu et seminibus distincta.

Frutex scandens, gracilis; ramuli suberosi, sulcati. *Folia* membranacea, glabra, integra, ovata vel ovato-lanceolata, apice acuminata, basi profunde cordata, auriculis sursum dilatatis rotundis introrsum convergentibus, 5–15 cm. longa, 3–7 cm. lata, pedatim 5–7-costata, costarum pare lateralium interiore fere ad apicem extenso, nervis e costâ media 2–3 cum reticulatione obscuris; petiolus gracilis, 3–5 cm. longus. *Flores* in racemis paucifloris puberulis 1 cm. longis; bracteae vaginantes ovato-acuminatae, 3 mm. longae. *Perianthium* 1·5 cm. longum, basi globosum, inde curvatum et labiatum, labio superiore bifido, inferiore producto torto lineari. *Stamina* 6 minutissima, styli columnae adnata. *Stylus* in columnam brevissimam productus, in discum 6-lobum et 6-apiculatum desinens. *Capsula* obovata, 2–5 cm. longa, 6-costata et prominenter transverse rugosa. *Semina* pyriformia, concava, 1 cm. longa, cum placenta cymbiformi crustaceâ dehiscentia; testa rugosa; albumen carnosum.

Malay Peninsula. Perak: in dense forest, *Ridley*, 8022, 10,259; *Kunstler*, 1964.

Var. **dolabrata**, *Gamble*; varietas distincta, perianthii labio superiore ad 3 mm. longo et lato, labio inferiore ad 1 cm. longo; in alabastro labia cum tubo dolabram simulantia.

Malay Peninsula. Perak: in the mountains up to 1000 m. alt., *Wray*, 2997; *King's collector*, 2969.

XIV.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: XI.

ANNELIDA.

Oligochaeta.

Rev. Hilderic Friend.

The species of annelids found in the Royal Botanic Gardens, Kew, fall into four groups. There are first the British earthworms known as Lumbricidae, of which some thirty species are indigenous in our islands. Then come the foreign worms, belonging chiefly to the Perichaetidae and Geoscolicidae. Next we may mention the smaller worms found in soil, leaf mould, and among decaying bulbs,

a group which has so far been but little worked, known as Euchytraeidae ; and finally the water worms, among which much yet remains to be done.

No addition has been made to the Euchytraeids since the first list was issued, and only one species to the list of water worms. The chief work has been done among the larger species, both British and foreign ; and, as the nomenclature of the former has been undergoing revision of recent years, I propose to give a complete list of the Lumbricidae found in the Gardens up to date, marking those already recorded with an asterisk, and supplying notes where points of special interest are involved.

So far as the foreign species are concerned I shall be content to add the names of any newly found species, with such notes as may be desirable ; referring the reader to the former list for such as have already been recorded. Following the order adopted in that catalogue, we have to add the under-mentioned.

Limnodrilus sp. Coll. H. F., August 4th, 1909, in putrid soil, on the margin of the Lily pond near the North Gallery.

Perichaeta nipponica, *Beddard.* Monogr. Olig. 413. Coll. J. Lambourne.

***Trichochaeta hesperidum,** *Beddard.* Monogr. Olig. 647. This worm was first described from a specimen found at Kew. As the description was based on a specimen whose girdle had not been formed I am glad to be able to complete the description. This annelid contains 180 segments, and is 3½ inches long in alcohol. When living it extended from 4 to 8 inches. The girdle occupies segments 14 to 21, and on three of the segments (18–20) is a white band which corresponds with the tubercula pubertatis in *Allolobophora.* The nephridiopores are large, especially on the girdle, and open in a line with the 3rd seta (Fig. 1). The neutral setae from the region of the girdle to about the 50th segment are paired. Propagating pits. Coll. J. Lambourne.

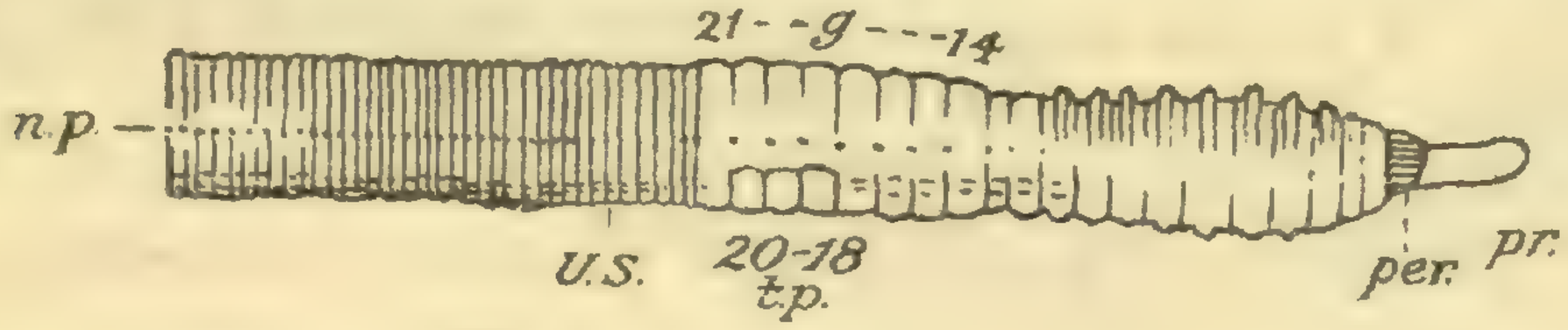

Fig. 1.

Fig. 1. ***Trichochaeta hesperidum*, Beddard.** × 2., *g.* girdle (14–21) ; *per.* peristomium ; *pr.* prostomium extended ; *t.p.* (18–21), tubercula pubertatis ; *n.p.* nephridiopores, lateral view ; *v.s.* ventral setae, paired in anterior portion of body.

I have also received a set of very delicate worms, from the pits, collected by R. G. Simpson, which appear to be Geoscolicides ; but as they always arrive dead and sadly distorted, I have so far been unable to obtain a satisfactory diagnosis.

Lumbricidae.

I turn now to the Lumbricidae. Among the additions are one or two of special interest, to which attention will be called in the

notes. A few British species have so far not been found, as, for example, *Lumbricus festivus*, Savigny, *Dendrobaena mammalis*, Savigny, and *Allurus tetraedrus*, Savigny.

***Lumbricus terrestris**, *Linn.* (=*L. herculeus*, Dugès of former list.)

***Lumbricus rubellus**, *Hoffmeister.*

Lumbricus castaneus, *Savigny.* The smallest species of *Lumbricus* found in Britain.

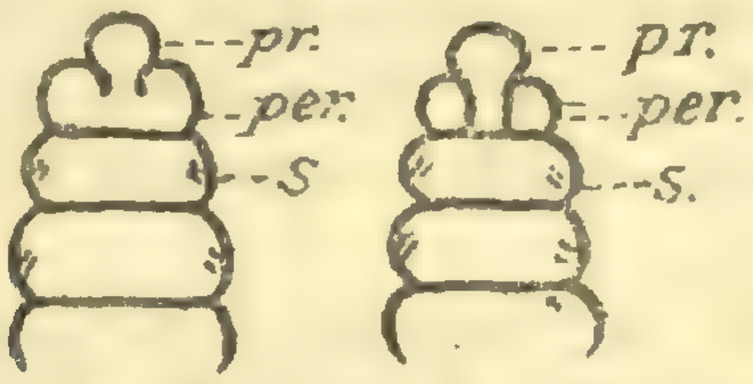

Fig. 3.

Fig. 2.

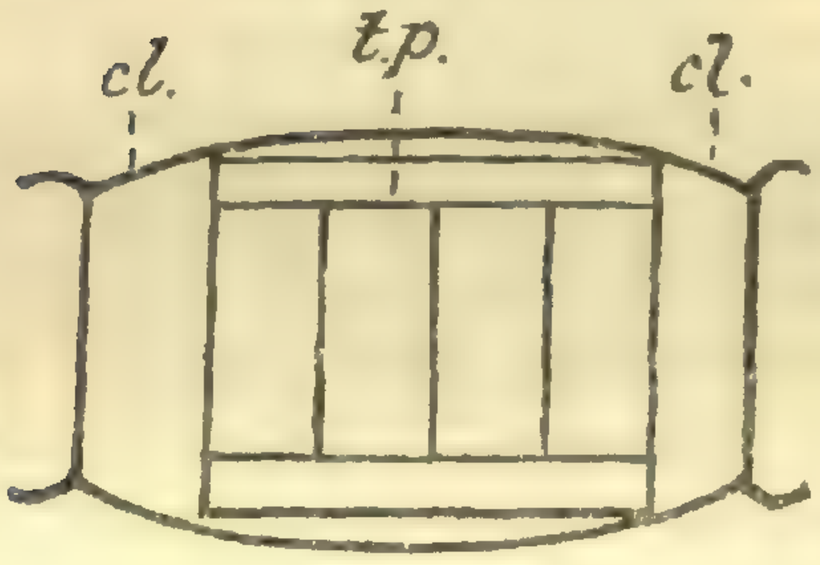

Fig. 4.

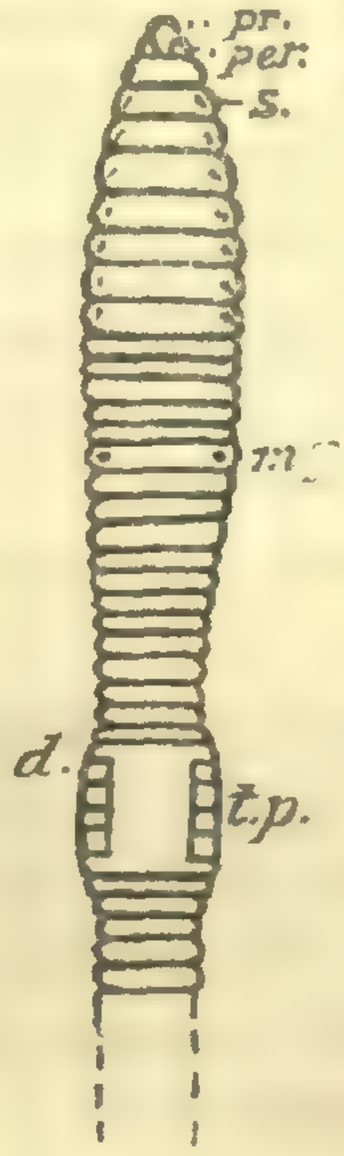

Fig. 5.

Fig. 2. Head of *Lumbricus.*
Fig. 3. Head of *Allolobophora.*
Fig. 4. Girdle of *Lumbricus.*
Fig. 5. Diagram of *Lumbricus.*

pr. prostomium or head; *per.* peristomium or first body ring without setae; *m.p.* male pores on 15th segment; *cl.* clitellum or girdle bearing tubercula pubertatis (*t.p.*).

***Allolobophora longa**, *Ude* (=*A. terrestris*, Bedd., of former list). Constantly confused with *Lumbricus terrestris*, on account of similarity in size and distribution. They may at once be distinguished by observing the position of the girdle and tubercula. *See* illustration (Diagram Cells).

Allolobophora trapezoides, *Dugès.*

Allolobophora turgida, *Eisen.*

These two worms are very closely allied, and are frequently referred to *A. caliginosa.* The specimens from Kew, however, are very distinct. In addition to the native forms we have them in Wardian cases from the Chatham Islands, September, 1909. Coll. C. P. Raffill and H. Green.

***Aporrectodea chlorotica**, *Savigny* (=*Allolobophora chlorotica*, Vejdovsky, of former list). This worm is distinguished by the presence of three pairs of pores instead of a band on the girdle, forming the tubercula pubertatis and three pairs of spermothecae.

***Bimastus constrictus**, *Rosa* (=*A. constricta*, Rosa, of former list).

Dendrobaena arborea, *Eisen.* First recorded for Kew, September 3rd, 1909. Herbaceous ground. Coll. M. Free.

Dendrobaena subrubicunda, *Eisen.* Received with the last. Coll. M. Free.

Dendrobaena octoedra, *Savigny.* First recorded for Kew, September 16th, 1909. Herbaceous ground. Coll. M. Free.

***Eisenia foetida,** *Savigny* (=*Allolobophora foetida*, Eisen, of former list).

Eisenia rosea, *Savigny.* Though a native of Britain it has also been received from the Chatham Islands, September 2nd, 1909. Propagating pits. Coll. H. Green.

Eisenia veneta, *Rosa.* Though we have several well marked varieties of this interesting annelid, the type was not known in England till I received it from Kew, on September 3rd, 1909. Herbaceous ground. Coll. M. Free. (*See* Gardeners' Chronicle, October 9, 1909, p. 243, fig. 108.)

Octolasion studiosum, *Rosa* (known as *Allolobophora studiosa*, and *A. profuga*). One specimen received from Kew in February, 1910, which differed greatly from the type in colour when living, but not distinguishable from it in alcohol. Propagating pits. Coll. J. Lambourne.

Dendrobaena submontana, *Vejdovsky.* This was first received in September, 1909, at which time it was not perfectly adult. I published a description in the Gardeners' Chronicle of January 29th, 1910; but shortly afterwards was favoured with another consignment which contained an adult specimen. This shewed the tubercula pubertatis clearly on segments 28 to 30; a point of great interest because it definitely proves the species to be quite distinct from *Eisenia veneta*, Rosa, which it greatly resembles outwardly. In *E. veneta* the tubercula are on 30 and 31, and there are internal differences as well. *See* illustration in Gardeners' Chronicle, January 29th, 1910, p. 74, fig. 42. Propagating pits. Coll. H. E. Downer.

An addition of at least a dozen new species in less than a year is not a mean record, and says much for the enthusiasm and careful observation of the young gardeners, to whose services I am so greatly indebted.

COLEOPTERA.

W. E. Sharp.

(*British species.*)

Geodephaga.

Harpalus aeneus, *F.* Herbaceous ground. Coll. M. Free. A very common ground beetle.

Carabus violaceus, *L.* Fern houses. Coll. E. W. Morse. Generally common in the London district.

Pterostichus madidus, *L.* Propagating pits. Coll. R. Joyce. Very abundant and widely distributed.

Hydradephaga.

Hydroporus planus, *F.* Propagating pits. Coll. H. Ruck. One of the smaller water beetles, widely distributed in Britain.

Dytiscus circumflexus, *F.* Tank in Nursery. Coll. W. Dallimore. One of the larger species, occasional in standing water throughout the London district but not common and restricted in range to the south of England.

A larva of another and commoner species of the genus, *D. marginalis*, L., has been taken in one of the outside Lily tanks. Coll. C. P. Raffill.

The presence of both these species in such circumscribed waters is explained by the fact that the perfect insects fly readily and frequently, and often alight and deposit ova in quite superficial pools.

Serricornia.

Ptilinus pectinicornis, *L.* Arboretum. Coll. W. Dallimore. A not uncommon species where larvae bore into palings, gate posts, &c., and very frequently into the dead timber of standing beech.

Lassioderma serricorne, *F.* In small white beans in propagating pits. Coll. H. Green. Like several species which have been taken here, this is a cosmopolitan insect whose larvae, feeding as they do on various seeds and roots (ginger, liquorice, &c.), are carried about the world by commerce. There is no reason to doubt that the species was thus imported with seeds of some kind to Kew, and although normally a 'British beetle' has no real claim to a place in the British fauna.

Clavicornia.

Necrophorus vespillo, *L.* Bulb pit. Coll. R. Joyce. One of the 'burying beetles' which deposit their ova in dead animals, and whose larvae feed on carrion; generally distributed in Britain.

Heteromera.

Helops striatus, *Foure.* Propagating pits. Coll. H. E. Downer. A very common British species, often found under bark, especially of dead fir trees and usually in dry and sandy localities.

Rhyncophora.

Scolytus destructor, *Ol.* Arboretum. Coll. W. Dallimore. One of the wood-boring weevils, common and very injurious to elm.

(*Exotic species.*)

Exechesops jordani, *W. E. Sharp.* Coll. H. Green. This very distinct and interesting species was discovered among seeds of a Lily imported from Tanganyika, Africa. Previous to its description the genus *Exechesops* contained but five species only, one of which (*E. monstrosus*, Pasc.) was a native of Africa. The present species is much larger than any of the others, and its exceedingly prominent eyes give the insect a remarkable aspect.

The nearest British ally to *Exechesops* is perhaps *Macrocephalus albinus*, L. A very rare species found occasionally in decaying wood.

Ptilodactyla sp.? Coll. H. Green. This *Ptilodactyla* appears to have become provisionally established in our orchid houses, specimens having been taken at intervals during the last two or three years. *Ptilodactyla* is a Central and South American genus and also occurs in some of the West Indian Islands. Our species bears a close resemblance to *P. probanda*, Kirsch., but is probably undescribed as there are no named examples of it either in the collections of the British Museum, or those of the Zoological Museum of Dresden, which latter contains most of the species of *Ptilodactyla* known to science.

No doubt the Kew species was originally imported with some orchid from tropical America.

XV.—MISCELLANEOUS NOTES.

Mr. Ernest Samuel Dodd and Mr. Ernest Edward Mawer, members of the gardening staff of the Royal Botanic Gardens, have been appointed by the Secretary of State for India in Council, on the recommendation of Kew, probationer gardeners for service in India.

Dr. Peter MacOwan, F.L.S,—We are indebted to Dr. S. Schönland, Director of the Albany Museum, Grahamstown, Cape Colony, for the following obituary notice of the late Dr. MacOwan, F.L.S., who died at Uitenhage, Cape Colony, on December 1st, 1909. Dr. MacOwan was a frequent and highly valued correspondent of Kew, and the South African collections in the Herbarium have been very considerably augmented through his instrumentality. The genus *Macowania* was named in his honour by Prof. D. Oliver in 1870.

The son of a well-known Methodist minister, MacOwan was brought up in a very hard school which would have crushed any less elastic spirit. This hard school was, unfortunately, continued more or less through his long life, in which he never found work with congenial surroundings or worthy of his exceptionally high abilities. It was his sad fate to have to devote the best years of his life to mere drudgery, small wonder then that he at last made drudgery the main business of his life, and found relief occasionally in satirical writings which sparkled with knowledge and wit. However, only few of these were published under his name.

He was born at Hull, November 14th, 1830, educated at Kingswood College and Islington Grammar School. At the age of 16 he became a tutor at Bath, thence passed to Colchester in 1849, and became housemaster at the great Wesleyan School at Woodhouse Grove, near Leeds, in 1853. In 1857 he accompanied Dr. Samuel Sharpe, the Headmaster, to Huddersfield College, taking duty as tutor in Chemistry, and graduating in London University the same year.

Having to earn his own living at such an early age, I cannot understand how he amassed the encyclopaedic knowledge which he

undoubtedly possessed. He was a good classical scholar, finding recreation up to near the end of his life in the study of the best Latin and Greek authors; he had a rare acquaintance with the best English literature in almost all its branches; he read and spoke French fluently, and had a good acquaintance with German. While in England, he took a great interest in archæological studies, and made large collections of brass-rubbings and impressions of seals and coins. Some of these brass-rubbings and all his impressions of seals are now in the Albany Museum. They are prepared with a patience and skill which could hardly be excelled. This habit of preparing specimens with his own hands in the most scrupulously careful manner clung to him through life, and the tens of thousands of botanical specimens which he distributed gratis to the leading herbaria of the world will testify to this. It made him, however, averse to employing any assistance for mechanical work except very late in life. Already in England he had begun to study Botany. He took up especially Phanerogams and Mosses. In 1860 his health began to give way, lung-troubles appeared, and in 1861 he left Huddersfield to take charge of a projected "College" at Grahamstown. Fortunately, his health was already restored during the sea-voyage, and he never again had any serious illness until late in life. The promoters of the "College" named Shaw College had no clear idea what they wanted and it was never more than a school; besides, as MacOwan put it, "When it was projected wool was up, and when he came out wool was down." Little of the expected financial support was forthcoming, and he had a hard struggle to keep the school going. However, from an educational point of view, his efforts were crowned with success. Although a stern master, his former pupils to this day speak of him in the most affectionate terms, and it cannot be a mere coincidence that many men who passed through his hands in Grahamstown, and later at Somerset East, have been most successful in after life, and are noted as amongst the ablest and most upright men in South Africa. In Grahamstown he enjoyed the intimate friendship of Dr. W. G. Atherstone, Mr. H. Hutton and Mrs. F. W. Barber, all of whom took a keen interest in Botany. He got into touch with Dr. (now Sir Joseph) Hooker, the late Dr. Harvey, the late Dr. Sonder, the late Prof. Asa Gray and other eminent botanists, all of whom encouraged him in his efforts to explore the flora of Grahamstown and the surrounding country. He laid here the foundations of his herbarium, and by his own collections and through exchanges, soon accumulated an enormous quantity of valuable material. Harvey paid him a grateful compliment in the preface to the third volume of the "Flora Capensis."

He left Grahamstown in 1869 to take up the post of science tutor at Gill College, Somerset East. This institution was expected to become a kind of University College for the Eastern Province of Cape Colony, but the time was not ripe for such an institution, besides circumstances over which he had no control and which we, looking back, can perceive clearly, made it from the first a hopeless failure. It took, however, many years before his enthusiasm was checked. He presented his herbarium to the

College, and mounted every single specimen with his own hands; he also made valuable zoological and other collections, a very fine beginning of a museum, for which he obtained a government grant through his influence with Sir Henry Barkly, the then Governor, who was in frequent friendly communication with him on botanical subjects. At Somerset East besides exploring the phanerogamic flora, he began to give special attention to Fungi and Lichens, and thus began his association with Kalchbrenner, Cooke and Lojka to which we owe to this day the greater part of our knowledge of South African Fungi and Lichens. He was a skilful microscopist, and gradually accumulated a fair amount of literature on the branches of Botany in which he was interested, besides a large amount of authentic material for comparison; but he very seldom liked to assume the responsibility of describing new species of plants, of which he discovered quite a host. He always preferred to send them to some specialist, frequently with complete diagnosis. From the time with which we are dealing dates approximately also his association with Dr. H. Bolus, who was then residing at Graaff Reinet.

In 1881 he was appointed Director of the Capetown Botanic Gardens, Curator of the Cape Government Herbarium, and shortly afterwards became in addition Professor of Botany at the South African College. It may here be mentioned that after he left Somerset East his herbarium was entirely unused, and it was a great joy to him when in 1904 the Trustees of Gill College were induced to present it to the Albany Museum. Although it had evidently dwindled down somewhat, it still contained 14,000 sheets of Phanerogams (many of them priceless types from most parts of the world) and 1,800 Fungi.

With his appointments at Capetown he seemed at last to have got the reward of hard work, and a sphere for the display of his abilities. The tasks before him, although beyond the power of the average man, would not have dismayed him if only they had been normal. His average working hours, up to late in life, were at least ten a day (Sundays and public holidays included), but he had been set impossible tasks. The so-called botanic garden was in the main a trading establishment aided by a small government grant on ground quite unsuitable for a true botanic garden and badly provided with water, &c. At the College there were no instruments, no books and no other aids in teaching. He supplied the most necessary things at his own expense. In those days the study of Botany did not "pay" in the University examinations at the Cape, and in any case the number of students would have been small. That the classes had to be given up after about half a dozen years was not altogether his fault. He had to submit to the force of circumstances. One of his former pupils, Dr. Juritz, in describing this phase of MacOwan's activities, in the South African Journal of Science (Vol. I, 3) says: "In facility of illustration and apt quotation he was not easily matched, and, when some obscure point needed elucidation, he was as ready with a humorous anecdote at one moment as he was with an appropriate passage from the Greek classics at another. Now it would be Homer, and then Oliver Wendell Holmes, for with both he had an equally intimate

acquaintance, and one or other of these stores of culture and learning seemed always at call when he wished to point a moral or adorn a tale. The Philosopher was many a time summoned from his breakfast-table and, what is more, from that "vasty deep" he seemed to come, and to enter into the actual being, fibre and marrow, of the speaker, so that the latter appeared his very *alter ego*. Under such circumstances, it is needless to remark, the botanical class-room was the very antithesis of being dry-as-dust; the lectures sparkled alternately with satire and humour, while quotation, anecdote and reminiscence combined to drive home many a point which but for those associations would perchance have passed unheeded through the sieve-like student-mind. His black-board diagrams—like his word-paintings—were generally rapidly accomplished by means of the fewest possible master-strokes, but whenever these were made they pithily conveyed the exact impression intended, and he was a dull student who would remain untouched by the Professor's almost boyish enthusiasm."

The affairs at the botanic gardens were quite pathetic. Instead of directing a scientific establishment he had to carry on a precarious retail-business in plants and seeds, and it is much to his credit that when he left in 1892, he could hand it over to the Municipal authorities with a small credit balance although he carried out a number of costly improvements which to a large extent had been paid for out of money earned by him. The reports which he presented to the Government made his position clear from year to year. To anybody acquainted with the local circumstances they are very interesting, and the grim humour frequently displayed by the writer would be amusing if it had not been a transparent cloak of his sorrows and anxieties.

As far as Government support and the interest of the general public were concerned the herbarium was naturally the Cinderella of the three departments over which he presided. As might be expected, he devoted all his spare-time to it. When he took it over it was fearfully neglected and badly housed, in fact practically condemned as mere lumber. It was not until 1892 that a couple of decent rooms could be assigned to it. He gives a short retrospect in his report for that year:—"The total number of cabinets is now thirty-one, as against seven, which was the number in 1881, and contained the study-set as far as *Campanulaceae*, mounted by Dr. Harvey in 1864. These figures show that, scanty as has been the leisure left to the Curator till recently, the whole collection has been more than quadrupled. In accounting for this large increase by intercalations, it must be remembered that the basis of the herbarium once the property of Zeyher, and afterwards of Dr. Pappe, consisted of collections made from about the year 1825 to 1849, and the specimens, besides being very old, had suffered much from neglect and unskilful curation. Even the study-set, selected and mounted by Dr. Harvey, was allowed to lie for several years without being treated with sublimate to prevent insect depredations. This most simple of precautions was at last enforced by Sir Henry Barkly, soon after his arrival from Mauritius, on finding the extent to which the mischief had proceeded. Under these circumstances the obvious course for the present Curator was, first

to go through the whole series, taking nothing for granted and sublimatizing everything, precisely as should have been done after the original purchase; and next, to supply from his own and other sources additional sheets of authentic specimens supplementary to the older and more or less damaged examples. It is in this way that the large increase in the bulk of the collection has come about. Another excellent result indirectly following is the enlargement of the geographical area represented. It has happened that the localities in which the Curator and his contributory botanical friends have prosecuted their studies for the last thirty years are different from those particularly sought over by Ecklon and Zeyher. It is only since 1878 or thereabouts that the older botanists' happy hunting-grounds in the Cape West and the Peninsula have been beaten once more. Therefore in all these renewals and intercalations, not merely the betterment of the study-specimens has been secured, but also a permanent record of the flora of localities very insufficiently or not at all worked over by Ecklon, Zeyher and Drege."

By 1901 there were 61 cabinets comfortably full. His reference to the additions of his collections is characteristically modest. I can put it a little more plainly by stating that he brought an enormous mass of his duplicates from Somerset East at his own expense, and incorporated them with the Government Herbarium. The herbarium was removed with the Agricultural Department into a building in Grave Street where the accommodation was ample, but the risk of its being destroyed by fire constantly haunted him. As a matter of fact, the adjoining property was destroyed by fire, and the herbarium premises were only saved as if by a miracle, after portions had actually been set alight. At last, the Government granted him a special building at the back of the South African Museum, but to say the least, it was not worthy of the collections it was to house, nor of the man who was to take charge of it. Here, however, he spent his last years before he gave up all official work.

In 1884 he began with Mr. Henry Bolus the issue of the "Herbarium Normale Austro-Africanum." This co-partnership ceased after 15 centuries had been issued. Five more centuries were issued by him single-handed. As these collections were issued gratis a fair return in valuable material accrued to the Cape Government in exchanges. Fortunately, he was able to interest and train a number of enthusiasts who assisted him with South African material, but every one of these will readily admit that he always gave more than he received by naming specimens and help in other directions. Of course, if he had any material to spare Kew always got the first chance. Sir W. Thiselton-Dyer acknowledged this in the preface to the sixth volume of the "Flora Capensis." He says "More than 30 years have rolled away since Prof. Harvey bore eloquent testimony to the indefatigable services of Peter MacOwan, Esq., B.A., F.L.S., then Principal of Shaw College, Grahamstown, now Government Botanist. Time has not staled his enthusiasm for the beautiful Flora amidst which he has spent the best years of his life, nor his energy in investigating it. Without his self-sacrificing aid the present undertaking would have been

miserably incomplete. By a correspondence which has never intermitted, he has done all in his power to keep Kew abreast of the progress of botanical discovery in South Africa. And he possesses the happy art of communicating some touch of his enthusiasm to others, and has thus secured the investigation of many parts of the area of the Flora which might otherwise have remained all but unknown."

MacOwan also distributed study-sets to various schools and did everything in his power to further the study of Botany in Cape Colony schools.

From the very first when he found that I was making an earnest attempt to form an extensive herbarium in connection with the Albany Museum, he sent me everything that he thought might be of use to us, and as years went on, with the risk of fire at the Capetown Herbarium, he deliberately set himself the task of duplicating the Capetown collection as much as possible at Grahamstown. Great was his joy, therefore, when I induced the Trustees of the Gill College to hand over their (or rather his) collection to us, and if to-day the herbarium of the Albany Museum holds an honourable position amongst similar institutions it is to a preponderating extent due to him.

As Director of the Botanic Gardens he was naturally obliged to give special attention to horticultural matters and to Economic Botany generally. It was not long before crowds of people from all parts of South Africa, gardeners, farmers, importers, manufacturers, came to him for advice on all kinds of matters on which he might help them. He also got into touch with the Agricultural Departments of the United States of America, and of the British Colonies, to whom he issued plants and seeds for acclimatisation and from whom he received valuable plants for trial in Cape Colony. I think it was first in 1887 that the Cape Government acknowledged this work by employing him as official Consultant on Economic Botany. From that time he had to pour out a regular flood of reports, many of which were published in the Agricultural Journal of Cape Colony, founded in 1889, while hundreds of them were merely filed. It is not too much to say that those published in the Journal bore evidence of wide acquaintance with the literature of the subjects dealt with, of a fairly thorough acquaintance with the immensely varied local conditions in Cape Colony, and of keen observation aided by sound common-sense. Besides, they were written in a crisp and sparkling style, interspersed with homely similes and appropriate humorous allusions. For many years they formed a most valuable ingredient of the Cape Agricultural Journal. He hit out pretty hard sometimes when ignorant people, who ought to have known better, pestered him with enquiries, but he had an immense circle of friends amongst his readers, who welcomed everything "The Professor" was publishing, and I may add, many of them followed his advice with great advantage to themselves. He was particularly severe on all those who practised slovenly methods and, although he sometimes did not gauge practical difficulties sufficiently, much of the improvement in cultural matters which has taken place in recent years on Cape Colony farms, is due to his persistent preaching.

At the end of 1891 he resigned the Directorship of the Gardens and became Government Botanist, retaining the post of Curator of the Herbarium. These appointments he held until his voluntary retirement in 1905.

It has already been indicated that the farming community of Cape Colony owed MacOwan a great deal. Two of his achievements stand out from many others. He first introduced the Australian salt-bush and found the right man, Mr. E. Alston, to spread it. Thus many acres of valueless brak land have been turned into valuable pasture, but above all Cape Colony owed to him more than to anybody else the introduction of fruit-culture on a big commercial scale, and it seemed hard that his great services remained unacknowledged, while others reaped the reward of his labours. To do him justice I must add that he himself felt fully rewarded in the consciousness of doing his duty to the country of his adoption. He never cared for official honours, and when in 1904 the University of the Cape of Good Hope conferred upon him the degree of D.Sc., honoris causa, he only accepted the honour because he was afraid that by refusing he would give offence to the kind friends who had secured it for him. He had been a member of the Council of the University almost from its inception and acted for a number of years as one of its examiners. He also joined the South African Philosophical Society (now the Royal Society of South Africa) at its formation in 1876 and was for many years one of its most active members. In 1885 he was elected its President, but as years went on and especially when bodily infirmities made themselves felt, he became more and more a recluse. When the South African Association for the Advancement of Science was formed in 1903 he wrote to me :—" All these tokens of the awakening of the scientific spirit have come too late to be of any use to me. I am content to keep quietly on in the old groove and shall think it enough to have built up a good herbarium out of next to nothing."

He never visited England after he had come out here, and even in South Africa he did not travel much. There was never any time for it.

For a couple of years after his retirement he worked daily for 6 or 7 hours at the herbarium of the Albany Museum, chiefly putting the Gill College collection into excellent order again. In his private life he had many cruel trials and disappointments to which no reference can be made here, but his spirits had remained almost boyish, as Dr. Juritz rightly put it, until about five years ago. Two years ago he had a slight stroke of paralysis and finding the climate of Grahamstown rather too cold in winter he removed to Uitenhage. The end came gradually though not unexpectedly. He met it in the same philosophic spirit in which he had gone through life. He left a son and two married daughters with their families to mourn his loss.

His work was chiefly pioneering work in a "new" country, but I venture to think that should the true history of South Africa ever be written an honourable place will be occupied in it by MacOwan's work.

S. SCHÖNLAND

Angola Rubber (*Carpodinus gracilis*, Stapf).—Under the heading "Rubber Production in Angola," an article appeared in a recent number of the Board of Trade Journal, from information supplied by Mr. H. G. Mackie, H.M. Consul at Loanda, in which it is stated that the above-mentioned plant is the source of "Wild Rubber" collected in that region.

In Flora of Tropical Africa, vol. iv. p. 84, Dr. Stapf describes this species of *Carpodinus* as a dwarf, somewhat prostrate shrub, distributed in Lower Guinea and South Central Tropical Africa, and on p. 599 states that (according to De Wildeman and Gentil) the latex is useless. Several species of this genus are, however, known to yield good rubber, including *C. lanceolata*, which is stated to be the source of most of the root rubber of the Congo.

From the article in question, it appears that careful investigations have been conducted by a Government botanist in the regions lying between the rivers Cutato and Cutchi and the Cubango and Cului on the plateau of Benguella. Among the numerous latex-yielding plants collected, the most promising rubber plant is said to be a shrub (*Carpodinus gracilis*), growing in shady places on a soil with no rocks or stones, but having a deep layer of sand free from stagnant water. This shrub furnishes a rubber of good quality, which is extracted by the natives by beating the rhizomes (horizontal stems) between two pieces of wood—one having a flat surface and the other shaped like a mallet. The bark is thus separated from the wood and reduced to fragments, held together by the rubber in the tissues, the globules of caoutchone coagulating as soon as they come in contact with the air, and thus none of the latex is lost. As soon as the bark that contains the rubber is peeled off, the native continues the beating operation until the whole is reduced to a spongy elastic mass, known in the trade as a "manta" or sheet. The "manta" at this stage consists of the rubber threads binding the broken bark that has been reduced to powder. It is now worked in cold water and again beaten. Repeating this working and beating process, the native is able to prepare a physically almost pure rubber, at the expense, however, of great labour. For this last reason it does not always pay him to clean the rubber too much. After this working and beating process, the spongy mass turns into a flaccid rubber sheet of less than half an inch in thickness and sometimes as much as 4 feet square. The rubber sheet is now steeped in boiling water for some five minutes, when it becomes quite plastic, and in this state is shaped by hand into its characteristic sausage-like form of about 10 inches in length. Although the water is pressed out as much as possible during the modelling operation, the rubber still contains 30 per cent. of moisture, which must, of course, be evaporated if the rubber is to be preserved from damage. The drying of the rubber has to be attended to by the buyer. The native frequently collects large loads of stems and rhizomes in the cold and dry season far away from his village, and the loads are brought in and stored for weeks before the rubber is extracted. If there is much dry material to work, it is immersed overnight to render the bark more malleable and less adherent to the wood.

The rubber in question is classified as second-class rubber in Angola, as it is usually badly cleaned, *i.e.*, full of particles of bark.

A first-class product could be obtained from this plant in Angola if the natives would take the trouble to clean the rubber more than they do.

One-fifth of the ground traversed by the Government botanist between the Cubango and the Quembo, an affluent of the Cuando, is covered by this plant, from 16 degrees south latitude, to the Congo basin ; it thrives better, however, in some localities than in others.

The root rubber industry, entailing a great amount of manual labour, is essentially a black man's industry, but the methods of extracting and preparing the rubber leave much to be desired. The employment of machinery, would, no doubt, help to solve the problem, but the lack of means of communication is at present the chief obstacle to the attainment of a higher standard. Moreover, the country is not yet occupied, and the natives are much too uncivilised at present to admit of much improvement.

Rubber is gathered over a vast expanse of country by the natives, who carry it on their heads to the up-country stores where they barter it for other goods. These stores are situated in the populous centres and follow up the trade, the merchants moving from one district to another, as circumstances may require. In 1903, a European bought 26,500 lbs. of rubber in the populous valley of the Cuango, an affluent of the Kuito; soon afterwards three Portuguese factories started business on that river. The produce is likewise brought in by Boer wagons, the Portuguese traders using these conveyances for penetrating into the unoccupied regions for hundreds of miles.

J. M. H.

Botanical Magazine for March.—The plants figured are : *Rehmannia Henryi*, N. E. Brown (t. 8302); *Aquilegia alpina*, Linn. (t. 8303); *Rhododendron mucronulatum*, Turcz. (t. 8304); *Pittosporum Colensoi*, Hook. f. (t. 8305); and *Notylia trisepala*, Lindl. (t. 8306).

The *Rehmannia* was first discovered in Central China by Mr. Augustine Henry, and during Mr. E. H. Wilson's last visit to the same region seeds of it were collected for the Director of the Arnold Arboretum through whom the plant has been added to the Kew collections. It was originally identified with *R. Piasezkii*, Maxim., but further examination shows that it is distinct from that species. Its large flowers are yellow or yellow and white, with numerous minute red specks chiefly on the corolla-tube. The plant introduced into cultivation a few years ago as *Rehmannia angulata*, Hemsl., and figured at t. 8177 of the Botanical Magazine, is provided with a new name, *R. elata*, N. E. Brown. It differs from the true *R. angulata* in being twice as large, in having differently lobed leaves and larger differently coloured flowers. *Aquilegia alpina* is a native of the Alps and the Apennines, and the plant figured, which flowered in the garden of Mr. D. Hill, of Watford, was obtained by Mr. A. W. Hill on the Pleine Madeleine, near Chandelon, in Valais. It has large blue-violet flowers. The *Rhododendron* is a pretty species belonging to the same group as

R. dauricum, Linn., from which it is distinguished by having larger thinner acute leaves, which fall off before the flowering stage, and larger more numerous flowers. The Kew plants were obtained by purchase from a firm of nurserymen in Yokohama in 1907. *Pittosporum Colensoi* is a New Zealand species which, though tender in most parts of the United Kingdom, flourishes out-of-doors in the gardens of Mr. T. A. Dorrien Smith, Tresco Abbey, Isles of Scilly, from which the material for the figure was sent. *Notylia trisepala* is a small epiphytic orchid with a long pendulous raceme of very small pale green flowers, and is a native of Mexico. The specimen figured flowered in the garden of Mr. W. E. Ledger, at Wimbledon, and was presented by him to the Kew collections.

The Stem Bleeding Disease of the Cocoanut.—A well illustrated account of a serious disease of the Cocoanut, by Mr. T. Petch, is contained in Circular No. 22 of the Royal Botanic Gardens, Ceylon. The leading symptoms of "Bleeding disease" are the exudation of a dark-coloured sap from cracks in the "bark." This sap is somewhat viscid and gradually forms a patch of perceptible thickness, which soon turns black. These patches vary much in size, being sometimes quite small, in other cases several feet in length and 6 inches or more broad. The effect of the disease varies much with the age of the tree, and the injury is most severe up to 40 years of age, and in severe cases the disease hollows out the stem almost to the bud, yet without killing the tree. In trees under 10 years old, the external patch is usually quite small, and gives no indication of the extent of internal decay, which may be very considerable. On trees over 40 years old, although the patches may be numerous, the substance of the trunk is not materially injured, the "wood" being generally so hard that it resists the attack of the fungus. An extensive series of cultures and inoculations have proved the disease to be caused by a fungus named *Thielaviopsis paradoxa*, v. Höhn. (*Thielaviopsis ethaceticus*, Went.), a well-known parasite of the sugar-cane.

Notwithstanding the serious nature of the disease, the trees are rarely, if ever, killed outright, neither is there any material diminution in the crop, even when the trunk is hollowed out.

All varieties of the cocoanut appear to be equally susceptible to the disease, though the "King cocoanut" suffers more than the others when trees of the same age are considered.

The treatment recommended is to completely cut out the diseased portion of wood, and to cover the wounded surface with coal tar. All diseased portions should be collected and burned, and not allowed to lie on the ground at the base of the trunk.

A short reference to this disease appeared in *K.B.* 1908, p. 310.

A Disease of the Cacao Plant.—*Diplodia cacaoicola*, P. Henn., was described on Cacao from the Cameroons in the year 1896; more recently it has been reported to occur in Ceylon, Java, Samoa, Surinam, West Indies and St. Thomè (West Africa). It may, therefore, be said to be parasitic on the cacao plant wherever it is cultivated to any appreciable extent. Whether the species is

indigenous in the countries in which it is now known to occur or to what extent it may have been transported from one country to another cannot be definitely said.

The fungus attacks both the stem and the fruits of the plant. The disease of the stem is known as "die-back" owing to the fact that when a shoot is affected death commences at the tip and gradually extends towards the base. The younger shoots are usually first affected; later on the disease spreads to the older branches and sometimes even to the trunk. Between the healthy and the dead parts of a branch there is an intermediate zone which may in some cases extend for distance of two feet and on which the black perithecia of the fungus can be seen bursting through the bark. After the branches are dead and even after they have fallen the fungus continues to grow on them and to produce its perithecia in large numbers.

The disease of the pods is known as "brown pod"; it makes its appearance in the form of a discoloured patch at one or other end of the pod or at a wounded surface. The discoloured area increases in size and extends over the greater part of the surface of the pod. Pods may be attacked in all stages. Young pods when once affected with the disease seldom reach maturity; old pods, however, which develop the disease when nearly ripe, may be allowed to ripen and the seeds may be used.

The results of infection-experiments have shown that the fungus can only effect an entrance into the stem through a wound. In the case of the fruit, however, it is thought that, in addition to entering through a wound, the fungus is capable of entering at the stigmatic and at the basal end of the pod.

Diplodia cacaoicola is regarded by some observers as being synonymous with other species:—Griffon and Manblanc (1909) consider *Botryodiplodia Theobromae*, Pat., *Macrophoma vestita*, Prill. and Del., *Lasiodiplodia nigra*, Appel and Laubert, and *Diplodia cacaoicola* to be identical; Petch regards *Botryodiplodia elasticae*, to which he has attributed the later stages of a "die-back" disease of *Hevea brasiliensis*, as indistinguishable from *Diplodia cacaoicola*; Van Hall considers the species of *Diplodia*, *Lasiodiplodia* and *Chaetodiplodia* occurring on Cacao to be identical.

Diplodia cacaoicola is known to be parasitic on the sugar-cane; it is said to grow on *Castilloa* in the West Indies, and also to cause a root-disease of the Cocoa-nut Palm in Trinidad.

Diplodia cacaoicola is at present classified among the *Fungi Imperfecti*; the only form of reproduction known is by means of dark-brown, one-septate spores produced in black perithecia which are borne on the diseased stems and fruits. By analogy, *Diplodia cacaoicola* is expected to be connected with a more highly developed or ascigerous stage and possibly with one or more conidial forms. Among the diseased material received at Kew two conidial forms have been observed to be closely associated with the mycelium of *Diplodia*, the one corresponding with the form-genus *Cephalosporium* and the other with the form-genus *Mycogone*; experiments are being conducted with a view to ascertaining whether these two forms can be connected with *Diplodia*. Cultural experiments are also being conducted for the purpose of determining whether *Diplodia* will give rise to an ascigerous stage.

Until the life-history of the fungus has been completely worked out it will be difficult to suggest proper remedial measures for exterminating the disease; the following, however, are the methods of treatment usually practised :—

By careful cultivation, manuring and pruning, a vigorous condition of growth is induced, since plants which are growing vigorously are seldom affected with the disease.

All wounds made during pruning and such as may arise from other causes are immediately sealed with coal tar or with a mixture of coal tar and clay.

All diseased branches, pods and husks of pods are removed and buried in pits with lime.

The following are references to the more important articles on the fungus :—

P. Hennings.—Fungi camerunenses I.; Engler Bot. Jahrb. Bd. xxii., p. 72.

A. Howard.—Annals of Botany, vol. xv., p. 683, pl. xxvii.

Van Hall.—Dept. van den Landbouw, Suriname, Bull. 21, 1909.

F. A. Stockdale.—"Fungus Diseases of Cacao," Imperial Dept. of Agriculture for the West Indies, Pamphlet Series, 54, 1908.

F. C. von Faber.—"Die Krankheiten und Parasiten des Kakaobaumes," p. 228.

T. Petch.—"Die-Back" of *Hevea brasiliensis*; Circulars and Agricultural Journal, Royal Botanic Gardens, Ceylon, vol. iv., No. 23, 1910.

C. K. Bancroft.

Angsenna Tree Disease.—The Angsenna tree, *Pterocarpus indicus*, Willd., which is used as a roadside and avenue tree in Malacca and Penang, has been attacked by a serious disease which threatens its complete destruction. The trees are quite a feature of Penang, and whether covered with golden bloom or out of flower with their graceful foliage are alike of conspicuous beauty. At Penang, according to information received from Mr. Fox, Superintendent of Forests and Gardens, Penang, about 100 trees have been killed since the disease was first noticed a few years ago. In his letter Mr. Fox writes: "As these magnificent trees are the pride of Penang, and as most of the main thoroughfares are exclusively planted with them, it will be understood what a serious calamity has overtaken them."

It is surmised that the disease is the same as that which carried off the magnificent avenue of this tree along the sea shore in Malacca some 30 years ago.

At the beginning of January, 1910, six specimens of fungi found growing on the trunks or dead stumps of trees that had recently been cut down were received from Mr. Fox with the following information as to the disease :—

"The disease is apparently confined to this tree only, and appears to be propagated sporadically as well as by contact underground. It is a frequent occurrence for a healthy tree situate a quarter of a mile away from an infected one to be attacked. In other cases

several trees will be attacked in sequence. The first sign of attack is one or more of the main branches having a wilted appearance and shedding their leaves; other branches soon follow and generally in less than two months a magnificent tree will be dead. The majority of those attacked are about 100 feet tall with a trunk 4 to 5 feet in diameter. I have noticed, however, a few younger and smaller trees also attacked and killed.

"Specimen no. 6 is interesting, inasmuch as it comes from a tree that had apparently been killed. In cutting it down I noticed that some branches about 10 feet from the ground were quite healthy. I therefore had the trunk cut off above the live portion, and to-day these branches are growing vigorously.

"The method of combating the disease (so far with but little success) has been to cut trenches around the tree and dust with lime and sulphate of copper. Owing, however, to the road intervening on the one side, and a ditch on the other, the trenches have been simply divisions between the trees only. Doubtless the mycelium has travelled under the road."

The fungi have been examined at Kew. Four of the specimens were found to be *Polystictus occidentalis*, Fries, and the two other specimens were *Polystictus floridanus*, Berk., and *Schizophyllum commune*, Fries.

Of these, *Polystictus occidentalis* is the only parasitic species, and but little is known respecting its life history; judging from analogy, however, it seems probable that its diffusion can be effected by wind-borne spores or by underground mycelium spreading from one tree to another. No cure for the disease is known. It is possible that the trees, which are large and presumably old, are becoming too weak to supply the required amount of food and water to the branches, and hence are all the more liable to succumb to the attack of a parasitic fungus. Such a fungus, when once established on old and weakly trees, will readily pass to young and vigorous trees of the same kind. It is suggested that if a trench could be formed around the base of the trunk of the diseased trees and flooded with a weak solution of nitrate of potash or nitrate of soda (preferably the former) about once a week for two months, the disease might be checked. The strength of the solution should be one pound of the nitrate to three gallons of water.

Manihot preciosa.—In the Report of the Agricultural Department, Gold Coast for 1908, p. 24, a reference is made to a Manicoba rubber under the name of *Manihot precosa* planted in 1906. We are informed by the Governor, through the courtesy of the Secretary of State for the Colonies, that the name in question should be *Manihot preciosa*, and that this name has been applied to a variety of Manihot by Mr. Schindler, of Bahia, Brazil, who sent to the Gold Coast the seeds from which the plants have been raised.

Allusion to this supposed species of *Manihot* is also made by Thompson in his report on Gold Coast Forests—Col. Rep., Misc. 66, 1910, pp. 12–13—where it is stated that the plants are said to yield rubber at a very early age, a statement which it has not yet been possible to verify.

Specimens of the leaves of this *Manihot* have recently been received from Mr. A. E. Evans, Travelling Instructor, Gold Coast, and it now appears probable that the plants should be referred to *Manihot dichotoma*, Ule.

Visit to Cobham Hall.—On December 13th a visit was paid to Cobham Hall, near Gravesend, for the purpose of selecting planks of various kinds of timber, which the Earl of Darnley had promised to present for the Forestry Museum. The estate has long been famous for well-grown timber, and competent authorities credit it with producing the largest ash in the country. About the garden, a number of fine ornamental trees were observed, particularly *Ginkgo biloba*, *Quercus Phellos*, *Q. Ilex*, *Taxodium distichum*, *Sophora japonica*, *Sequoia gigantea*, *S. sempervirens*, *Cedrus Libani* and *Liriodendron Tulipifera*. In the deer park and plantations, however, the largest trees were noted. The ground is rather heavy and well suited for ash, oak and sweet chestnut, in fact a large area of land in the neighbourhood is given over to coppice wood, in which ash and sweet chestnut figure largely. Among the park trees conifers were rarely noted, whilst comparatively few were to be seen in the plantations. Hornbeam grows to a large size, while the same may be said of beech and sycamore.

Time did not allow of measurements being taken of the large trees, but Mr. Scriven, the estate agent, kindly furnished me with the dimensions of the following trees, which were taken a short time ago. The girth, except where otherwise stated, was taken at 5 feet from the ground :—

Quercus Ilex	...	...	...	...	75 ft.	by	15 ft.	10 ins.
„ *Phellos*	...	...	...	...	83 „	„	9 „	3 „
Sophora japonica	...	...	...	...	81 „	„	10 „	4 „
Ginkgo biloba	...	...	...	...	73 „	„	9 „	5 „
Liriodendron Tulipifera	...	...	...		75 „	„	8 „	6 „
Sequoia sempervirens	...	...	...		88 „			
„ *gigantea*	...	...	...	...	77 „	„	14 „	7 „
Liquidambar styraciflua	...	...	...		75 „			
Taxodium distichum	...	...	...		78 „	„	7 „	4 „
Acer Pseudo-platanus	...	...	...		102 „	„	17 „	10 „
„ „	...	...	...		91 „	„	15 „	3 „
Tilia vulgaris	...	...	...	...	104 „	„	13 „	2 „
Fraxinus excelsior	...	...	...	...	144 „	„	14 „	6 „
„ „	...	...	...	...	144 „	„	11 „	9 „
„ „	...	...	...	...	128½ „	„	12 „	6 „
„ „	...	...	...	...	79 „	„	14 „	9 „
„ „ with curiously twisted trunk, known as the "Twisted Ash"	...				116 „	„	17 „	8 „
Carpinus Betulus	...	...	...	...	82 „	„	11 „	6 „
„ „	...	...	...	...	82 „	„	8 „	8 „
Fagus sylvatica	...	...	...	...	97 „	„	12 „	6 „
Castanea sativa	...	...	...	...	92 „	„	14 „	9 „
„ „	...	...	...	...	82 „	„	14 „	2 „
Quercus pedunculata	...	...	...		91 „	„	17 „	2 „
„ „	...	...	...	...	76 „	„	12 „	10 „

Ulmus campestris (at 4 feet)	91 ft.	by 17 ft.	1 ins.
Juglans regia	76 „	„ 13 „	6 „
„ *nigra*	67 „	„ 8 „	2 „
Populus nigra	96 „	„ 11 „	4 „
Æsculus Hippocastanum (at 4 feet) ...	87 „	„ 14 „	0 „
Prunus Avium	91 „	„ 12 „	10 „
Quercus Lucombeana	81 „	„ 11 „	10 „
Cedrus Libani	99 „	„ 15 „	5 „
„ „ (at 2 feet)	86 „	„ 19 „	2 „

W. D.

Baobab Trees used for Storage of Water.—Sir Joseph Hooker has called our attention to an account of the manner in which the natives of Kordofan form reservoirs for rain water in the trunks of living Baobab trees (*Adansonia digitata*). The paper by Captain Watkiss Lloyd, late Governor of Kordofan, Soudan, from which the following extract is taken is published in the Geographical Journal, March, 1910, pp. 253-254, with an illustration of the tree on p. 251. The country referred to lies to the west of El Obeid.

"Elsewhere the people are dependent on water-melons and the water they store in baobab trees. The melons are small and almost tasteless, and are grown in enormous quantities amongst the corn. When ripe they are collected in heaps and protected from the sun until required for use.

"The baobab trees have to be carefully prepared for use as reservoirs. The large branches are first cut off near the trunk. If this is not done, the trunk is apt to split as soon as it is hollowed out. A hole is cut in the trunk, generally just above a branch, which serves as a platform for the man who is filling the tree, and the interior is hollowed out. Round the bottom of the tree a shallow basin some 20 or 30 feet in diameter is made, in which the rain-water collects. As soon as there is a storm, the people go out and fill their trees. The water so stored remains perfectly good until the end of the next hot weather, or even longer. A few trees, naturally hollow, have a hole at the top between the branches, and fill themselves, the branches catching the water and acting as gutters. These are called 'lagai,' and are highly valued by the Hamars.

"The Arabs did not invent this method of storing water, but improved on the system of their predecessors, who made the hole in the trunk only 10 or 12 feet from the ground. The present system gives a cistern 20 feet high and from 8 to 10 feet, or even more in diameter. Owing to the labour involved in preparing and filling the trees, water is usually bought and sold, and on the main roads where there is much traffic, as between Nahud and Jebel el Hilla on the way to El Fasher, the capital of Darfur, the people do a regular trade by supplying merchants and travellers with water.

"The bucket, called a 'dilwa,' used by the Arabs deserves mention. It consists of a piece of leather suspended by strings 6 inches long from a piece of wood bent in a circle, to which the rope used for drawing the water is fastened by three of four strings. On reaching the bottom of the well the leather opens out and collects the water, however little there may be."

Though this appears to be the first reference by an English geographer to the process of hollowing out the trunks of Baobab trees so as to serve as reservoirs, it is not the earliest record of the practice of storing water in this fashion in Kordofan. We are indebted to Captain H. G. Lyons, R.E., F.R.S., for having called our attention to a passage in Mr. J. Petherick's account of Egypt, the Soudan and Central Africa, published in 1861. At pp. 208, 209, Petherick says of the Baobab :—"its trunk and even branches, for the most part hollow, are of immense size, the diameter of the former attaining as much as 40 feet . . . .

"These trees, in many parts of the country where water is scarce, form highly valuable natural tanks, and when filled by the rains are carefully preserved and tapped by the natives during the drought, and enable them to inhabit parts of the country which otherwise, for want of water, would be untenable."

The Sand Dunes of New Zealand.*—The New Zealand Government recognising the importance of dune-reclamation, recently engaged the services of Dr. L. Cockayne with a view to the scientific study of the dunes of the Dominion. The report now issued deals mainly with the subjects of dune-formation, dune-movement, and the dune-flora, a knowledge of which is, as the author points out, absolutely essential before any intelligent scheme of reclamation can be discussed.

In New Zealand moving sands are extremely frequent near the sea-coast. Roughly speaking there are in the North Island 290,000 acres, and in the South Island 24,000 acres of dune-area. These dunes are of special interest in that they afford an opportunity of observing what nature has done for their fixation, a study not possible where for many centuries civilisation has modified the conditions.

After the introductory remarks a brief geographical account is given of the New Zealand dune districts. This is followed by the report proper, divided into two sections, (1) Geology and (2) Botany. In the geological section the material and origin of the dunes are discussed, and also their movement and the various forms of dunes that occur. A typical dune has a long windward slope at a variable angle, and a steep leeside which corresponds to the natural angle of rest of the particular sand of which the dune is composed. On the summit of the windward slope sand-binding plants occur. Even a scanty plant-covering checks the wind, and it is pointed out that a knowledge of the effect of obstacles is of great importance in the work of dune-reclamation. A solid obstacle deflects the wind, causes an eddy, and the advancing sand instead of piling up against the obstacle forms a heap at some distance in front. In the case of an open flexible obstacle (e.g., *Ammophila arenaria*) the sand is blown into the interior of the patch, fills it, and finally forms on the leeward side a tongue-like mass. The advantage, in sand-fixing, of a living plant with upright growth over a dead obstacle is obvious.

Most of the usual forms of dune areas are found in New Zealand ;

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* Report on the Sand Dunes of New Zealand. By L. Cockayne. New Zealand, Department of Lands, 1909.

ridges and hills, and the irregular mixture of mounds and hollows termed by Cowles the dune-complex. The fore-dune (the well-known ridge by the sea shore) forms in some places an unbroken wall covered by *Scirpus frondosus* or *Spinifex hirsutus*. In addition to the above there is the wandering-dune, the fixing of which is one of the most difficult questions in dune-reclamation. Cliff-dunes, sand-plains, and swamps also occur.

The wind-factor, so important in all dune problems, receives considerable attention, and the various ways in which this factor acts are clearly described. In addition to transporting sand the wind erodes, and it is easy to see that a dune area is in a constant state of change, construction and destruction going on together. Dunes that have become fixed frequently develop, through the irregular growth of the vegetation, sand-mounds and tussocks. The intervening depressions are sooner or later attacked by the wind ; deep gulleys result, the plants are uprooted, and finally the entire sand-hill may be blown away. A very small patch of loose sand may set a dune in motion, and the author remarks that the neglect by the farmer of wounds in the turf is perhaps the greatest source of danger to adjacent fertile lands. On account of the liability of irregular growth great care is necessary in the selection of sand-binders, the subsequent as well as the immediate growth having to be taken into consideration.

An account of the leading New Zealand dune plants with remarks on their life-forms and adaptations is included, and also a description of the plant-associations of Western Wellington, the study of which locality forms the basis of the report. With regard to the plant-associations a physiographical classification is adopted, sand-plains, stony-plains, swamps and true dunes being distinguished. Under the last heading the evolution of the "sand-grass" dune to the fixed dune is traced. The "sand-grass" dunes are distinguished by their instability and by the presence of *Spinifex hirsutus* and *Scirpus frondosus* (the latter being of special interest in that it belongs to an endemic section of the genus).

Calystegia Soldanella, *Festuca littoralis*, *and Calamagrostis Billardieri* are also found, but are of minor importance. Shrubs gradually appear in the formation, and becoming dominant, the second stage in dune development is reached, namely the shrub-dune. The shrubs consist of *Coprosma acerosa*, *Cassinia leptophylla* and *Pimelia arenaria*. The next stage in the process, the heath-dune, is marked by the appearance of *Leptospermum scoparium*. Other plants making up this formation are *Arundo conspicua* and *Phormium tenax*. Finally there is the fixed dune where a large number of plants can grow with *Pteris esculenta* (Bracken) or *Leptospermum* usually dominant. In certain localities these stable dunes are successfully used for crops of oats or rape.

The report, which is illustrated by excellent photographs, forms an interesting account of the general principles upon which dune-reclamation depends. In addition to these principles it is obvious that a thorough knowledge of the special circumstances of the country are necessary before the final report providing a scheme of reclamation and afforestation can be drawn up.

A. D. C.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1910.

XVI.—CHINESE RHODODENDRONS:

Determinations and Descriptions of New Species.

W. Botting Hemsley and E. H. Wilson.

I.—Introduction.

Towards the end of 1906, and just previous to his departure on a third mission to China, Mr. E. H. Wilson devoted a considerable amount of time to the determination of the magnificent dried collections of Rhododendrons made on his two previous journeys, while Mr. W. B. Hemsley afforded him as much assistance as it was possible to give in unofficial hours. The intention was to publish jointly descriptions of the new species, on the plan followed in "Some New Chinese Plants," which appeared in the Kew Bulletin for 1906, pp. 147–163. Mr. Wilson finished his share of the work before his departure, but it had, of necessity, to be somewhat hurriedly done, and both authors felt that some further scrutiny was desirable before venturing on publication. Through the courtesy of Professor H. Lecomte, Director of the Paris Herbarium, the types of the numerous new species of Rhododendron described by the late Mr. A. Franchet were transmitted to Kew for purposes of comparison; but Mr. Hemsley found himself unable during the last two years of his official life to make further comparisons, and complete his share of the task. In the meantime, however, Mr. J. Hutchinson had made a rough classification of the Chinese species, named a number of previously undetermined specimens, and found reason to question the validity of some of the new species proposed by Messrs. Hemsley and Wilson.

During the past year Mr. Hemsley has re-examined most of the specimens and has adopted many of Mr. Hutchinson's suggestions. Even yet something doubtless remains to be done before a satisfactory classification of the species can be offered. Some of those proposed as new are based on slender characters, and it is to be suspected that one or two may be natural hybrids. Unfortunately Mr. Wilson, on his return from his third journey with further field experience, found himself unable, owing to the pressure of other work, to look through the material again with Mr. Hemsley before

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leaving for America, so that in many instances Mr. Hemsley alone is responsible for the final determinations here published.

The following sketch of the Rhododendron vegetation of China was written by Mr. Wilson before his last journey, and he has had no opportunity of revising it; but the points dealt with are probably not susceptible of important modification. The original plan of the authors was limited to the publication of the new species in Mr. Wilson's collections, but the opportunity now offered has been taken to give determinations of all the specimens received at Kew since the appearance in 1889 of the enumeration of the species then known, published in the Journal of the Linnean Society of London, vol. xxvi. In doing this the numbers of the various collectors are cited, so that this addition may be of use to other institutions possessing sets of these dried plants.

A few modifications in the spelling of place-names have been admitted, the following being the most important:—Tatienlu for Tatsienlu; Szechuan for Szechuen; Omi for Omei, and Yangtsze for Yangtze.

II. The Distribution of Rhododendrons in China.

One of the outstanding features of recent botanical exploration in China is the wealth of Rhododendrons discovered. Up to the present time, and exclusive of the new species hereinafter described, no fewer than 134 species are known to occur in China proper: indeed, Rhododendron is one of the largest genera recorded from China.

The Index Kewensis enumerates to date (December, 1906) some 305 species of Rhododendron distributed as follows:—China proper, 134 species; Malaya, 62 species; British India, 46 species; Japan and Corea, 28 species; North America, 19 species; Orient, six species; Europe, four species; Siberia, three species; Arctic regions, two species; and Australia, one species. From Africa and from Central and South America the genus is absent. The above figures show conclusively that the headquarters of the genus is China. Now, a cursory knowledge of the distribution of the Chinese Rhododendrons is sufficient to prove that the centre of the greatest concentration of species is the wild and rugged region of the China-Tibet borderland—which region is a continuation of the Himalayas. The optimum is somewhere between Mupine, long. 102° 30′, lat. 31° about, and Tali, long. 100°, lat. 25° 50′ about. North of Mupine, Rhododendrons rapidly decrease in numbers, and in the extreme north-west of Szechuan and in Kansu, comparatively few species occur. The same obtains in the country south of Tali.

In China, the genus Rhododendron extends from sea-level to the limits of ligneous vegetation. There is no heather (*Calluna* or *Erica*) in China, and its place on the alpine moorlands is taken by dwarf, small-leaved Rhododendrons such as *R. fastigiatum*, *R. nigro-punctatum*, *R. intricatum*, and *R. blepharocalyx*.

The low-level species, such as *R. indicum* and *R. sinense*, are abundant on scrub-clad hills, but whilst the former extends from

the east to the west of the country, the latter scarcely occurs west of long. 112°. In Central and Western China, with the exception of the above two species and *R. Mariesii*, no Rhododendron occurs below 4000 ft. Above this altitude they occur in woods and forests in increasing numbers, reaching their optimum at about 11,000 ft. In the regions traversed by me, 15,500 ft. was the altitudinal limit of the genus. Farther west, however, it is somewhat higher. Rhododendrons are social plants, and at certain altitudes form immense thickets. At low levels, miles of the hillsides often are ablaze with the scarlet *R. indicum*. Up to 9000 ft. the Rhododendrons occur in constantly increasing numbers, in company with mixed dicotyledonous trees and shrubs and conifers. Above 9000 ft. they form the predominant shrubby vegetation, either as undergrowth in the conifer forests or above the tree limit, where they form impenetrable thickets. In late May and June these areas present a scene of indescribable beauty.

In stature, Chinese Rhododendrons vary from tiny plants six inches high (*R. nigro-punctatum*) to trees 40 feet high (*R. calophytum*). But omitting extremes, they are as a rule bushes from 6–20 feet high and as much in diameter.

Epiphytic species are rare, and only two, *R. dendrocharis* and *R. moupinense*, have been met with. The first-named is very common on coniferous trees, especially on *Abies Fargesii* and *Tsuga yunnanensis*. *R. moupinense* occurs on evergreen oaks and dicotyledonous trees generally. Both species are dwarf and twiggy, and at a distance are suggestive of species of *Loranthus*. But whilst true epiphytes are rare in the depths of coniferous forests, a large percentage of the Rhododendron bushes occur growing on the rotting trunks of fallen forest giants.

In colour the Chinese Rhododendrons range from the purest white, the clearest and richest yellow, the varying shades of red, the deepest and richest shades of crimson, to the darkest purple. In size the flowers may vary in diameter from less than a third of an inch (*R. anthopogonoides*) to three inches, *R. excellens*. With rare exceptions (*R. sinense*, *R. indicum*, *R. micranthum*, *R. Mariesii*, and possibly a few others) all the species are remarkably local, whether in longitudinal, latitudinal or altitudinal range. With the exception of *R. stamineum* none of the Hupeh species occur in western Szechuan. Very few of Père Delavay's Yunnan species are to be found even in South Szechuan although the regions are contiguous. The species collected by Père Bodinier in Kweichau Province are nearly all different from those collected in the adjoining provinces of Hupeh, Yunnan and Szechuan. The last collections to reach Kew from China are one made by Père Monbeig near Tsekou, a town on the Mekong river in the extreme north-west of Yunnan, and another from South-Western China, composed of very fine specimens, made by Mr. G. Forrest and presented by Dr. Bayley Balfour, F.R.S. Of the seventeen species of Rhododendron in Père Monbeig's collection, nearly half are new. With one exception all are distinct from those collected by me in a district two degrees of longitude east and two degrees of latitude north of Tsekou. Père Delavay approached to within 60 miles of Tsekou, yet only two of the species in Père Monbeig's collection were

met with by him. The altitudinal limit of any one species is well-defined, and within this limit a species monopolises its own particular region. This phenomenon is extremely interesting and often gives rise to distinct belts of colour. *R. Przewalskii* (*R. kialense*) attains the highest altitudinal range (14,500 ft.) of any of the large-leaved species.

The Chinese Rhododendrons form their own peculiar groups, some of which are extremely difficult to deal with taxonomically. It may be that these groups represent several or few distinct species, or possibly one or more variable species in which the individuals intercross and give rise to numerous intermediate forms. Many of the species hitherto described can only be regarded as provisional, and when our knowledge of these Chinese Rhododendrons is more complete a general revision will be necessary. A goodly number of them are now in cultivation in this country, and these should materially assist in elucidating some of the many problems necessarily connected with so large and unwieldy a genus.

The genus is difficult owing to the fact that good and obvious distinguishing characters are scarce; the calyx, capsule, tomentum and stamens perhaps yielding the chief diagnostic marks. Vegetative shoots, though very necessary, are most certainly insufficient in themselves. For this reason, and when the vast number of described species is borne in mind, it is not desirable to follow the example set in connection with two recently recognised species, *R. platypodon* and *R. coeloneuron*, and be content to base the recognition of new forms on the examination of vegetative shoots. The colloquial names given to these species—shan p' i-pa and chin p' i-pa shu—do not admit of practical application because the first is a general name with the Chinese for all the large-leaved Rhododendrons, whilst "chin" prefixed to the second name (though it might possibly mean among other things "clear" or "gold") signifies in all probability nothing more than green. Such vernacular appellations are commonly manufactured on the spur of the moment by natives of Eastern countries in response to the demand for a name.

The collection of Rhododendrons made by me in China consists of some 63 species. Seeds of practically all were sent home, and with very few exceptions the species are in cultivation with Messrs. J. Veitch & Son, in their Coombe Wood Nursery. From the altitude and latitude in which they occur, it is highly probable that nearly all will prove hardy and amenable to cultivation in this country.

The pleasure derived from working out this collection has been heightened by the fact of its affording the collector an opportunity of commemorating the names of various people to whom he had been indebted for hospitality and assistance in some form or other during his wanderings in China.

The use of nearly all of the late Mr. Franchet's types, for which Kew is indebted to the kindness of Mr. Lecomte, Director of the Paris collection, has rendered the task of determination very much easier than would otherwise have been possible.—E. H. W.

III.—Enumerations and Descriptions.

Eurhododendron.

I.—*Leaves not lepidote; usually densely tomentose beneath.**

Rhododendron taliense, *Franch.* in *Bull. Soc. Bot. France*, xxxiii. 232; *Hemsl.* in *Journ. Linn. Soc.*, xxvi. 31.

Szechuan. *Wilson*, 3953, 3957, 3968, 3970.

We at first thought we could separate the specimens bearing the above numbers into three species, but the differences, chiefly in degree of hairiness of the petioles, pedicels and filaments, are insufficient. All the specimens agree in having a glabrous ovary.

5-672 **Rhododendron Wasonii**, *Hemsl. et E. H. Wils.*; inter species foliis valde coriaceis subtus dense tomentosis (in siccis rufis) *R. taliensi* proxima, differt foliis suboppositis, floribus majoribus longius pedicellatis et ovario densissime furfuraceo-tomentoso. An varietas tantum *R. taliensis*?—W. B. H.

Bush about 1 m. high; branches thick, straight, hoary when young. *Leaves* scattered, sub-opposite, broadly-lanceolate or ovate, excluding the petioles 6–7 cm. long, 2·5–4 cm. broad, acute or cuspidate, base broadly cuneate or slightly auricled, glabrescent and slightly wrinkled above, densely clothed with reddish-brown felt beneath; primary and secondary veins somewhat immersed on upper surface; petioles thick, 5–8 mm. long, felted. *Buds* elongate; scales about 1 cm. long, narrowly-oblong, acuminate or ovate, aristate. *Flowers* about six, in short corymbose racemes; pink or creamy-white, 4–5 cm. across; rachis sparsely pubescent; pedicels stout, erect or nearly so, 1·5–2·5 cm. long, floccose. *Calyx* minute, oblique, annular, obscurely 5-toothed, densely floccose. *Corolla* broadly campanulate, slightly narrowed to base, 5-lobed, glabrous; lobes erect-spreading, rounded or emarginate. *Stamens* 10, included; filaments unequal, longest under 2 cm. in length, villous in the lower half. *Pistil* over-topping the stamens; ovary 4–5 mm. long, furrowed, densely villous, hairs brownish. *Capsule* about 1 cm. long, 4 mm. broad, furrowed, densely clothed with loose brown felt; calyx-teeth somewhat enlarged in fruit, obtuse.

Szechuan. Near Tatienlu on rocks in coniferous forests, alt. 2800–3000 m., *Wilson*, 3955, 3956, 3969, 3969A.

No. 3956 has more villous filaments and a rather more elongated inflorescence than 3955, and 3969 has somewhat smaller flowers. Named in compliment to Mr. Cathcart Wason, R.N., in 1903–04 Lieut.-Commander of H.M.S. "Woodlark" at Chungking, on the upper Yangtsze River, as a mark of appreciation of his kind offices.—E. H. W.

Rhododendron Faberii, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 22. R. Prattii, *Franch.* in *Journ. de Bot.* ix. 389.

Szechuan. *Pratt*, 58, 89; *Wilson*, 3958, 3958A, 3959, 3960, 3961, 5142.

This belongs to a group of species, or varieties, having very thick leaves densely felted on the under surface, similar to those of *R. taliense*, but differing from the latter in having a well-developed petaloid calyx.

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* As arranged in the Kew Herbarium by Mr. J. Hutchinson.

Rhododendron Brettii, *Hemsl. et E. H. Wils.*; ex affinitate *R. Faberii*, a quo differt foliis praeter costam subtus glabris, corymbis multifloris et floribus majoribus longius pedunculatis.—W. B. H.

Bush about 3 m. high; branches thick, densely clothed with rufous tomentum which persists for two or more years. *Leaves* crowded, oblong, lanceolate, excluding petiole 9–12 cm. long, 3–4 cm. broad, cuspidate or shortly acuminate, base slightly auricled; upper surface dark green, glabrous, somewhat wrinkled, lower surface pallid, glabrous; midrib immersed above, often felted at base, very prominent below, densely rufously tomentose, especially in lower half; petioles stout, 1–2 cm. long, rufously tomentose. *Flowers* twelve or more, subumbellate, multi-bracteate, pink with a dark red blotch, 5–6 cm. across; pedicel rather slender, spreading, 2·5–3 cm. long, densely glandular and sparsely pilose; bracts crowded amongst leaves and flowers, persistent, variable; outer thick, more or less subulate, flattened at base, 2–2·5 cm. long, rufously tomentose; inner membraneous, spathulate or ovate-spathulate, 2–3·5 cm. long, rounded or obtuse, silkily pubescent. *Calyx* petaloid, 5-lobed, glandular and pilose, tube nearly obsolete, lobes oblong, 10–13 mm. long, 3–4 mm. broad, acute or obtuse, erect. *Corolla* widely-campanulate, narrowed to base, 5-lobed; tube pubescent within at base; lobes erect-spreading, broad, deeply emarginate. *Stamens* about 10, included; filaments unequal, 1·5–3 cm. long, villous in lower half. *Pistil* over-topping stamens; ovary about 4 mm. long, glandular and sparsely pilose; glands stalked; style with stalked glands in lower half; stigma very large. *Capsule* 1·5–2 cm. long, 8 mm. broad, furrowed, clothed with shortly-stalked glands; calyx lobes appressed to capsule.

SZECHUAN. Neighbourhood of Tatienlu, at 2750–3000 m. above sea-level, *Wilson* 3973.

A very striking and handsome species, not common. Named in commemoration of the kind hospitality and assistance given by Mr. H. J. Brett, of H.B.M.'s Chinese Consular Service, who was stationed at Chentu, Szechuan, in 1904.—E. H. W.

Rhododendron bullatum, *Franch.* in *Bull. Soc. Bot. France* xxxiv. 281; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 20.

YUNNAN. *Monbeig*, 10; *G. Forrest*, 4141.

Rhododendron floccigerum, *Franch.* in *Journ. de Bot.* xii. 259.

YUNNAN. Tsekou, *Monbeig*, 8.

Rhododendron sanguineum, *Franch.* in *Journ. de Bot.* xii. 259.

YUNNAN. Tsekou, *Monbeig*, 13, 14.

Rhododendron Bureavii, *Franch.* in *Bull. Soc. Bot. France* xxxiv. 281; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 21.

SZECHUAN. *Wilson*, 3954. YUNNAN. *G. Forrest*, 506.

Rhododendron haematodes, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 232; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 24.

YUNNAN. *G. Forrest*, 4130.

Rhododendron floribundum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 232.

SZECHUAN. *Wilson*, 3967.

Rhododendron Falconeri, *Hook. f. Rhod. Sik. Himal.* 11, t. 10; *Bot. Mag.* t. 4924.

YUNNAN. Mountains north of Mengtsze at 3000 m., *A. Henry*, 9448; Great Black Mountain range at 3000 m., *W. Hancock*, 439.

Mr. Wilson was disposed to regard the Chinese specimens as specifically different from the Indian *R. Falconeri*, distinguished by the calyx, the constantly 7-lobed corolla and other slight differences, but further comparison of all the specimens at Kew is against this conclusion. He describes it as a tree about 6 metres high with leaves from 15–36 centimetres long and clusters of 12–20 pale yellow or primrose flowers.—W. B. H.

Rhododendron Wiltonii, *Hemsl. et E. H. Wils.*; species elegans *R. floribundo* proxima, ab eo tamen differt foliis minoribus obovatis vel oblanceolatis supra nitidis, genitaliis omnino inclusis et filamentis infra medium puberulis.—W. B. H.

Bush, 1·5–2·5 m. high; branches stout, more or less pubescent, often clothed with dark-coloured persistent bracts; bark rough, scaly. *Leaves* crowded, very coriaceous, oblong-obovate, excluding petiole 5–8 cm. long, 2–3·5 cm. broad, apiculate or cuspidate, base narrowed to the petiole, shining green, rugose above, heavily clothed with loose brown felt beneath; midrib and secondary veins impressed above, much raised below; petioles 1·25–2 cm. long, more or less felted. *Flowers* six or more, surrounded by a cluster of bracts, sub-umbellate, pink with red spots, 3–4 cm. across; pedicels stout, spreading, 1·5–2·5 cm. long, floccose; bracts numerous, clustered among the flowers and leaves, linear-oblong-acuminate, spathulate or orbicular, floccose or glabrescent, many persisting for a year or more. *Calyx* minute, annular, obscurely 5-toothed, floccose; teeth obtuse. *Corolla* widely campanulate, 5-lobed, glabrous; lobes short, slightly spreading, rounded or emarginate. *Stamens* about 10, included; filaments unequal, 1–1·5 cm. long, dilated and somewhat villous below the middle. *Pistil* overtopping stamens; ovary 4–5 mm. long, very floccose; stigma small. *Capsule* cylindric, 1·5–2·5 cm. long, 4–6 mm. broad, furrowed, clothed with rufous-brown, floccose tomentum; calyx-teeth in fruit slightly enlarged, ovate, obtuse, appressed to capsule.

SZECHUAN. In thin woods at 3300 m. above sea-level, *Wilson*, 3952.

A very interesting species belonging to a small group having shining, bullate or rugose leaves, represented heretofore in China by *R. bullatum*, Franch., and *R. detersile*, Franch. The first-named is a native of western Yunnan and has ovate, very bullate leaves, and an enormous calyx. *R. detersile* is a native of north-east Szechuan, and has shortly-stalked, verruculose leaves, sub-auriculate at the base, with a calyx intermediate between that of *R. bullatum* and that of *R. Wiltonii*.

Named in compliment to Mr. E. C. Wilton, C.M.G., of H.B.M.'s Chinese Consular Service, in 1900 Acting Consul at Ichang, as a mark of appreciation of numerous kind offices during that troublous year.—E. H. W.

Rhododendron strigillosum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 232.

SZECHUAN. *A. Henry*, 8872; *Pratt*, 311; *Wilson*, 3974.

Rhododendron auriculatum, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 20.
HUPEH. *A. Henry*, 7562, 7725; *Wilson*, 1467.

Rhododendron adenopodum, *Franch.* in *Journ. de Bot.* ix. 391.
HUPEH. *Wilson*, 1161.

Rhododendron Fordii, *Hemsl.* in *Kew Bull.* 1894, 5.
KWANGTUNG. *Ford.*

Rhododendron formosanum, *Hemsl.* in *Kew Bull.* 1895, 183.
FORMOSA. *A. Henry*, 1976.

Rhododendron Przewalskii, *Maxim.* in *Mel. Biol.* i. 771; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 29. R. kialense, *Franch.* in *Journ. de Bot.* ix. 392.
SZECHUAN. *Wilson*, 3968.

Rhododendron Delavayi, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 231; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 22; *Bot. Mag.* t. 8137.
YUNNAN. *Hancock*, 158; *A. Henry*, 10,983, 10,983A, 11,330; *G. Forrest*, 4093.

II. *Leaves not lepidote; glabrous below.*

a Leaves usually broad at the base; sometimes cordate.

Rhododendron orbiculare, *Decne* in *Flore des Serres* xxii. (1877), 169.
SZECHUAN. *Pratt*, 325; *A. Henry*, 8873; *Wilson*, 3951.

Rhododendron Souliei, *Franch.* in *Journ. de Bot.* ix. 393.
SZECHUAN. *Wilson*, 3971.

Rhododendron chartophyllum, *Franch.* in *Journ. de Bot.* ix. 398.
YUNNAN. *G. Forrest*, 2030.

Rhododendron selense, *Franch.* in *Journ. de Bot.* xii. 257.
YUNNAN. *Monbeig*, 12.

Rhododendron Sheltonae, *Hemsl. et E. H. Wils.*; species ex affinitate *R. selensis*, a quo differt foliis subtus minus conspicue venosis pallidis, staminibus glabris et ovario styloque per totam longitudinem glanduloso.—W. B. H.

Bush, 1–2 m. high; branches short; bark grey and rough. *Leaves* elliptic-ovate, excluding petiole 6–8 cm. long, 3–4 cm. broad, apiculate, base oblique or rounded, glabrous, dull green above, very pallid below; petioles stout, 1·5–2 cm. long. *Buds* broadly ovoid, obtuse; scales short, broad, rounded, apiculate, ciliolate. *Flowers* eight or more, sub-umbellate, pink, 4–5·5 cm. across; pedicels 0·75–2 cm. long, spreading, sparsely glandular. *Calyx* annular, oblique, 7-toothed, glandular; teeth minute, unequal, ovate, acute, often with a tiny apical tuft of white hairs, ciliolately glandular. *Corolla* widely campanulate, narrowed to base, 7-lobed; lobes spreading, usually emarginate. *Stamens* 12 or more, included; filaments 1·5–2 cm. long, straight, glabrous. *Pistil* as long as corolla, glandular; ovary 6–8 mm. long; style slightly thickened above the middle. *Capsule* cylindric, 1·5–2 cm. long, 5 mm. broad, glandular.

SZECHUAN. Neighbourhood of Tatienlu, in open country at 2750–3000 m. above sea-level, *Wilson*, 3977.

A very neat species, common on scrub-clad mountains near Tatienlu.

Named in compliment to Mrs. Shelton, wife of Dr. Shelton, Missionary at Tatienlu, to both of whom I am indebted for kind hospitality during 1904.—E. H. W.

Rhododendron Fargesii, *Franch.* in *Journ. de Bot.* ix. 390.
HUPEH. *Wilson*, 1877. YUNNAN. *Wilson*, 3972.

Rhododendron decorum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 230; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 22.
YUNNAN. *Hancock*, 157; *A. Henry*. 9155A; *G. Forrest*, 2119, 2253.

R. decorum belongs to a small group having large, corymbosely racemose flowers, and is closely allied to the eastern *R. Fortunei*, Lindl., differing in having white flowers with bearded filaments. Forrest describes the flowers as fragrant, white with green markings. Perhaps a variety of *R. Fortunei*, but in the absence of fuller material we do not venture to reduce it.

Rhododendron pachytrichum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 231.
SZECHUAN. *Wilson*, 3976, 3976A.

Rhododendron maculiferum, *Franch.* in *Journ. de Bot.* ix. 393.
HUPEH. *Wilson*, 1878, 6949.

Rhododendron Fortunei, *Lindl.* in *Gard. Chron.*, 1859, 868; *Maxim. Rhod. As. Or.* 21; *Bot. Mag.* t. 5596; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 23.
KIANGSI. *Bullock*. HUPEH. *A. Henry*, 5354; *Wilson*, 609.

Mr. Wilson was of opinion that his 609 represented a distinct species, but on further examination I am unable to accept this view. In the Index Kewensis the authorship of *R. Fortunei* is attributed, in square brackets, to T. Moore, but we have not found any evidence of the correctness of this record.

Mr. Consul Cooper collected *R. Fortunei* in 1884, on the Tientai Mountain, Chekiang, where, he notes, there were magnificent groves of it; Mr. T. L. Bullock collected it at Kiukiang, Kiangsi, in 1892. Writing of this species in the Gardeners' Chronicle, in 1859, Fortune states that *R. Championae*, Hook., was the only other species known, at that date, to inhabit China. It should be mentioned, however, that he did not include the species belonging to the section Azalea.

The specimens from Hupeh are rather more glandular than the eastern ones, and the leaves are mostly broadest above the middle.—W. B. H.

Rhododendron Hemsleyanum, *E. H. Wils.*; species distincta e grege *R. Fortunei*, Lindl., floribus grandibus, racemoso-corymbosis, ab omnibus speciebus hujus gregis foliis amplissimis basi alte auriculatis facile distinguitur.—W. B. H.

Bush, about 6 m. high; branches thick, glabrous. *Leaves* very coriaceous, oblong, excluding petioles 15–20 cm. long, 8–10 cm. broad, rounded, base deeply auricled, glabrous, dark shining green above, pallid below, primary and secondary veins prominent on both surfaces; petioles very thick, fleshy, 5 cm. long. *Flowers* ten or more in corymbose racemes, white, 6–8 cm. across; rachis thick,

reddish, about 7 cm. long, glandular and sparsely pilose; pedicels erect-spreading, 3–4 cm. long, pilose, with numerous, scattered gland-tipped hairs. *Calyx* nearly obsolete, annular. *Corolla* widely campanulate, narrowed to base, prominently veined, 7-lobed; lobes spreading, broad, rounded. *Stamens* 10, included; filaments slender, about 3 cm. long, very slightly dilated at base, glabrous; anthers oblong, 4–5 mm. long. *Pistil* overtopping stamens, clothed with shortly-stalked glands; style thickened and reddish above the middle; stigma very large, flattened. *Fruit* not seen.

SZECHUAN. Mount Omi, *Wilson*, 5138.

A remarkable, fine and distinct Rhododendron only met with on Mount Omi and very rare even there; not closely allied to any known species but nearest *R. auriculatum*, Hemsl., which has much more shortly auricled leaves more or less tomentose below, coarsely glandular-hairy petioles and a differently shaped corolla somewhat hairy outside. The only real points of agreement are the large flowers and auricled leaves in both species. *R. Hemsleyanum* is one of the most handsome and one of the largest growing of all Chinese Rhododendrons.—E. H. W.

Rhododendron Houlstonii, *Hemsl. et E. H. Wils.*; species ex affinitate *R. discoloris* et *R. Fortunei* a quibus differt foliis oblanceolato-oblongis basi cuneatis, pedicellis glabris et ovario apice glandulis longe stipitatis ornato.—W. B. H.

Bush, 1·5–4 m. high; branches stout, straight. *Leaves* oblong-obovate or oblong, excluding petioles 8–13 cm. long, 3–5 cm. broad, cuspidate; base more or less cuneate, rarely oblique; pallid below; midrib slightly immersed above, brownish and very prominent below; petioles stout, 1·5–3 cm. long. *Flowers* eight or more, in lax cormybose racemes, flesh-pink, 6–8 cm. across; rachis glaucescent; pedicels erect-spreading, 1·5–3 cm. long, more or less glandular. *Calyx* oblique, annular, obscurely toothed. *Corolla* widely campanulate, narrowed to base, 7-lobed, lobes erect-spreading, rounded or truncate. *Stamens* about 12, included; filaments unequal, 1·5–2·5 cm. long, slightly curved, glabrous. *Pistil* as long as corolla; ovary glandular in the lower, bearded in the upper, half; style stout, sparsely glandular, bearded near base. *Capsule* bluish-purple, cylindric, 2·5 cm. long, 7 mm. broad, rarely glandular.

WESTERN HUPEH. In woods, *Wilson*, 312, 2154 in part.

Named in compliment to Mr. G. Houlston, of the Chinese Imperial Maritime Customs Service, my companion on many a delightful ramble in the Ichang neighbourhood.—E. H. W.

Rhododendron Spooneri, *Hemsl. et E. H. Wils.*; ex affinitate *R. Fortunei* et forsan ejus varietas floribus minoribus, pedicellis crassis glabris et filamentis puberulis.—W. B. H.

Bush, 1–3 m. high; branches stout, straight. *Leaves* coriaceous, oblong-lanceolate or oblong, often broadest above the middle, excluding petioles 6–13 cm. long, 1·5–5·5 cm. broad, rounded, apiculate, base cuneate or sub-auricled, glaucous or very pallid below; petioles thick, 1–1·5 cm. long. *Flowers* ten or more, in lax corymbose racemes, white or pale pink, 5–7 cm. across; pedicels fleshy, erect-spreading or spreading, 2–4 cm. long, very glandular when young, speedily becoming quite glabrous; bracts oblong, 2–2·5 cm. long, clothed with white, silky, appressed hairs on both

surfaces. *Calyx* oblique, saucer-shaped, glabrous. *Corolla* widely campanulate, much narrowed to base, 7-lobed ; lobes rounded or truncate. *Stamens* about 16, included ; filaments 2–2·5 cm. long, sparsely glandular and villous in the lower half. *Pistil* equalling corolla, clothed with scattered, shortly-stalked glands ; style stout, cylindric ; stigma large. *Capsule* 4 cm. long, 1·5 cm. broad furrowed, slightly curved, brownish-purple.

Szechuan. Neighbourhoad of Tatienlu, on scrub-clad mountains 2650–3650 m. above sea-level, *Wilson*, 3975. Yunnan. Tsekou, *Monbeig*.

Père Monbeig's specimens have the leaves broader and subauricled at the base, less glaucous below ; the corolla-tube slightly hairy inside and the filaments more or less villous. In spite of these slight differences there can scarcely be any question as to their being conspecific with those from Yunnan.

Named in compliment to my friend Mr. H. Spooner, who very largely assisted in making up my collections into sets for disposal to different herbaria.—E. H. W.

β Leaves narrowed towards the base.

Rhododendron Vialii, *Franch.* in *Journ. de Bot.* ix. 398.

Yunnan. *A. Henry*, 11,563a, 13,271.

Rhododendron brevistylum, *Franch.* in *Journ. de Bot.* xii. 261.

Yunnan. *G. Forrest*, 4162.

Rhododendron hypoglaucum, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 25.

Szechuan. *Wilson*, 5137. Hupeh. *Wilson*, 311.

Rhododendron neriiflorum, *Franch.* in *Bull Soc. Bot. France* xxxiii. 230 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 28.

Yunnan. *G. Forrest*, 4144, 4164.

Rhododendron argyrophyllum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 231.

Szechuan. *Wilson*, 3962, 3963, 3966, 5137a.

Wilson's 3966 differs from the other specimens in having glabrous filaments, and his 3962a, which must also be referred to this species, has much less hairy filaments and otherwise differs slightly from the type.

Rhododendron Ririei, *Hemsl. et E. H. Wils.* ; species distincta esquamosa, ramis elongatis viridibus, foliis sparsis supra viridibus opacis subtus pallidioribus et floribus racemosis.—W. B. H.

Bush, about 6 m. high ; branches long, straight, with greyish-green bark when young. *Leaves* scattered, lanceolate or oblong-lanceolate, very rarely broadest above the middle, excluding petiole 10–15 cm. long, 3–5·5 cm. broad, shortly acuminate, base narrowed, cuneate, pale green glabrous above, grey below, midrib slightly immersed above, prominent below ; petioles 1·5–2 cm. long, glabrous. *Buds* ovoid, acute ; scales broadly-ovate, some ciliolate, lower acute, upper rounded. *Flowers* about ten in short corymbose racemes, white, about 5 cm. across ; pedicels spreading, very stout, 1·5–2 cm. long, sparsely pubescent. *Calyx* oblique, annular, obscurely 5-toothed. *Corolla* widely campanulate, 5-lobed ; lobes erect-spreading, broad. *Stamens* included ; filaments filiform, glabrous ? *Pistil* reaching to corolla-mouth ; ovary about 1 cm. long, densely clothed with short grey felt ; style very stout,

cylindric, reddish. *Capsule* large, cylindric, about 3 cm. long, 1 cm. broad, with shallow channels, greyish.

SZECHUAN. Mount Omi, *Wilson*, 5139.

Our material consists of two sheets; one with one old flower and very young fruit; the other with ripe fruit. The very large fruits afford a marked distinction from other members of the group to which this belongs, and in consequence we do not hesitate to describe it.

Named in compliment to the Rev. B. Ririe, of the China Inland Mission, Kiating, Western Szechuan, who rendered me considerable assistance during my second journey in China.—E. H. W.

Rhododendron discolor, *Franch.* in *Journ de Bot.* ix. 391.

SZECHUAN. *Wilson*, 1077. HUPEH. *Wilson*, 1077.

Rhododendron calophytum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 230.

SZECHUAN. *Wilson*, 3979.

Rhododendron sutchuenense, *Franch.* in *Journ. de Bot.* ix. 392.

WESTERN HUPEH. *Wilson*, 17, 2537, 5285, 6914.

Rhododendron Watsonii, *Hemsl. et E. H. Wils.*; species *R. sutchuenensi* simillima differt imprimis foliis subsessilibus, floribus minoribus longius pedicellatis et fructu minore curvato.—W. B. H.

Bush, 2·6 m. high; branches very thick, glabrous. *Leaves* clustered at ends of shoots, very shortly petiolate, obovate or oblong-obovate, excluding petiole 15–20 cm. long, 5–7 cm. broad, shortly acuminate, base narrowed to petiole, dark green, glabrous, somewhat wrinkled above, clothed with short, dense, grey felt beneath; midrib very large and broad, channelled above, very much raised below, secondary veins prominent on both surfaces; petioles thick, broad, winged, 0·5–1 cm. long. *Buds* globose; scales short, orbicular, concave, slightly pubescent on inner surface. *Flowers* twelve or more in short corymbose racemes, white with red blotch, 4–5 cm. across; rachis short, very thick, sparsely pubescent; pedicels spreading or erect-spreading, 2–3·5 cm. long, glabrous or nearly so. *Calyx* oblique, annular, 7-toothed; teeth unequal, largest 1–2 mm. long, ovate, acute or rounded. *Corolla* short, broadly campanulate, 7-lobed, glabrous; lobes elliptic, more or less spreading, rounded or emarginate. *Stamens* about 14, included; filaments unequal in length, 2–3 cm. long, sparsely pubescent in lower half. *Pistil* equalling in length the longest stamens, ovary about 8 mm. long, slightly puberulous, furrowed; stigma small, flattened. *Capsule* cylindric, often curved, about 3 cm. long, 8–10 mm. broad, woody.

SZECHUAN. In thin coniferous forests, at 3300–3800 m. above sea-level, *Wilson*, 3964.

Named in compliment to my friend and travelling eompanion, Mr. W. C. Haines-Watson, of the Chinese Imperial Maritime Customs Service.—E. H. W.

Rhododendron irroratum, *Franch.* in *Bull. Soc. Bot. France* xxxiv. 280; *Hemsl* in *Journ. Linn. Soc.* xxvi. 26; *Bot. Mag.* t. 7371.

YUNNAN. *A. Henry*, 10,275, 10,301, 10,853, 11,066, 11,067, 11,067B; *W. Hancock*, 179; *G. Forrest*, 2043, 2058, 4146; *Monbeig*, 4.

Dr. A. Henry's 10,853 from Yunnan and Père T. Monbeig's n. 4, from the same province, differ from typical *R. irroratum* in the filaments and ovary being glabrous or nearly so.

Rhododendron insigne, *Hemsl. et E. H. Wils.* ; inter species affines *R. irrorato* proximum et simillimum, ab eo tamen differt foliis sparsis margine haud undulatis et floribus distincte racemosis longe pedicellatis.—W. B. H.

Bush, 1·6 m. high ; branches thick, straight. *Leaves* very coriaceous, often sub-opposite, lanceolate-oblong, very rarely broadest above the middle, excluding petiole 9–13 cm. long, 3–5 cm. broad, shortly acuminate, base cuneate, margins reflexed, shining green above, uniformly clothed with dense, short, grey felt below ; midrib immersed above, raised below, secondary veins prominent on both surfaces ; petioles thick, 1–2 cm. long, flattened above. *Bud-scales* oblong or oblong-spathulate, 1·5–3 cm. long, acuminate, fleshy, brown, lowest filiform, flattened at base, upper ciliolate, more or less pubescent on inner surface. *Flowers* eight or more, in short lax corymbose racemes, pale or deep pink, 3–5 cm. across, bracteate ; bracts oblong-lanceolate or oblong, lowest filiform, 1·5–2 cm. long, 7–10 mm. broad, fleshy, brown, tomentose without, often pubescent within ; pedicels spreading or erect-spreading, 2–4 cm. long, reddish, sparsely pubescent. *Calyx* annular, sometimes truncately 5-toothed ; teeth short, broad, rounded, pubescent. *Corolla* wide campanulate, 5-lobed ; lobes erect-spreading, rounded or emarginate. *Stamens* 14 or more, included ; filaments 1·5–2·5 cm. long, villous in lower half. *Pistil* equal to the corolla in length ; ovary 6–8 mm. long, densely clothed with a white velvety pubescence ; style stout, glabrous, reddish ; stigma dark-coloured, flattened. *Fruit* not seen.

Szechuan. Mount Wa, at 2300–3000 m. above sea-level, *Wilson*, 3965 ; *Pratt*, 349 ; *A. Henry*, 8859.

An exceedingly distinct and very striking species, only known from Mount Wa. Neither Pratt's nor Henry's specimens are localised, but I happen to know that they were collected in the same place as my own.—E. H. W.

Rhododendron Davidii, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 230. R. oreodoxa, *Franch.*, l. c. ?

Szechuan. *Wilson*, 3978.

Specimens in the Kew Herbarium, received from Paris, and bearing the above names, are indistinguishable.

III.—*Leaves lepidote.*

Rhododendron ciliicalyx, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 233 ; *Hemsl* in *Journ. Linn. Soc.* xxvi. 21.

Yunnan. *A. Henry*, 10,524, 11,983, 11,983a.

Rhododendron excellens, *Hemsl. et E. H. Wils.* ; species *R. Dalhousiae* similis, differt calycis lobis latioribus distincte venosis, corolla extra lepidota et staminibus dimidio brevioribus.—W. B. H.

Bush, 3 m. high (*Henry*) ; branches stout, brown, lepidote. *Leaves* scattered, oblong, excluding petiole 15–18 cm. long, 5·5–6 cm.

broad, rounded or obtuse, apiculate, base somewhat narrowed, oblique, glabrous, very strongly veined, dark green, slightly wrinkled above, glaucous and lepidote beneath ; midrib very much raised below ; secondary veins immersed above, very prominent beneath ; petioles very stout, nearly cylindric, 2·5–3·5 cm. long. *Flowers* three or more, umbellate, white (*Henry*), 10 cm. long, 8 cm. broad ; pedicels stout, 2 cm. long, erect, lepidote. *Calyx* petaloid, glabrous, deeply 5-lobed ; tube saucer-shaped, 1·4 mm. deep, lepidote outside ; lobes orbicular, 6–9 mm. long, rounded, very sparingly ciliolate. *Corolla* deeply campanulate, 5–lobed, lepidote outside ; tube 7·5–8 cm. long ; lobes 2–2·5 cm. long, broad, erect-spreading, rounded or truncate. *Stamens* about 12, half the length of the corolla ; filaments 4–5 cm. long, flattened and pubescent in the lower half ; anthers oblong, 10–12 mm. long. *Pistil* reaching to mouth of corolla ; ovary about 1·5 cm. long, tapering to style, densely lepidote ; style stout, cylindric, lepidote in lower half ; stigma large, flattened, dark-coloured. *Fruit* not seen.

Yunnan. South of the Red River from Mengtsze, *A. Henry*, 13,666.

Undoubtedly the grandest of the Chinese Rhododendrons and comparable only with the Indian *R. Dalhousiae*, its nearest ally, from which it is easily distinguished by its more strongly veined and larger leaves, its different calyx, lepidote corolla, and stamens half the length of the corolla-tube. Henry remarks that only one specimen was brought in by a native collector.

This species is undoubtedly a native of moist warm-temperate forests, and with *R. Falconeri* forms a strong connecting link with the sub-Himalayan types of Sikkim and Assam. In view of the remarkably local distribution of most of the Chinese and Himalayan Rhododendrons, it is very surprising to find species so evidently and closely allied, separated by some fifteen degrees of longitude and by several stupendous mountain ranges.—E. H. W.

Rhododendron lutescens, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 235.

Szechuan. *Wilson*, 3939.

Rhododendron Augustinii, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 19.

Hupeh. *Wilson*, 302. Szechuan, *Wilson*, 3950.

The Szechuan specimens, from an altitude of about 3000 m., have smaller leaves, and the under surface of the midrib is glabrous.

Rhododendron Harrovianum, *Hemsl.* in *Gard. Chron.* 1910, xlvii. 4 ; *Bot. Mag.* t. 8309.

Szechuan. *Wilson*, 1433, 3942 partly.

Cultivated specimens of this species were received from Messrs. James Veitch & Sons, bearing the number 3942, but Wilson's dried specimens bearing this number are different.—W. B. H.

Rhododendron lepidotum, *Wall. Cat.* n. 758 ; *Royle Illustr. Him. Pl.* 260, t. 64, f. 1 ; *Bot. Mag.* tt. 4657, 4802 *et* 6450, *fide C. B. Clarke* in *Fl. Brit. Ind.* iii. 471.

Yunnan. *G. Forrest*, 2505.

Rhododendron heliolepis, *Franch.* in *Bull. Soc. Bot. France* xxxiv. 283 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 24.

YUNNAN. *Monbeig*, 6, 11.

Rhododendron sulfureum, *Franch.* in *Bull. Soc. Bot. France* xxxiv. 283 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 31.

SZECHUAN. *Wilson*, 4143.

Rhododendron Hanceanum, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 24.

SZECHUAN. *Wilson*, 5141.

Rhododendron yunnanense, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 232 ; *Bot. Mag.* t. 7614.

YUNNAN. *Wilson.*

Rhododendron Benthamianum, *Hemsl.* in *Kew Bull.* 1907, 319 (excl. 3940 et 3942, Wilson) ; *Gard. Chron.* 1910, xlvii. 4.

SZECHUAN. *Wilson*, 1766, 1878, 1969.

By an oversight Wilson's 3940 and 3942 (= *R. concinnum*, Hemsl.) were cited under the first description, and in consequence of a lapse of memory the species was described again in the Gardeners' Chronicle.—W. B. H.

Rhododendron polylepis, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 232.

SZECHUAN. *Wilson*, 3941, 3949.

Rhododendron concinnum, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 21. R. yanthinum, *Bur. et Franch.* in *Journ. de Bot.* v. 94.

SZECHUAN. *A. Henry*, 8874 ; *Pratt*, 326, 848 ; *Wilson* 3940, 3940A, 3942 mainly.

This species was founded on an imperfect specimen collected by the Rev. Ernest Faber on the summit of Mount Omi ; but there is now ample material at Kew under the above numbers. Pratt's 848 and Wilson's 3940A differ from the type in having leaves 4 to 8 cm. long. Messrs. James Veitch & Sons sent cultivated specimens of the typical form to Kew in May, 1909, under the number 1524.

Rhododendron coombense, *Hemsl.* in *Bot. Mag.* t. 8280.

SZECHUAN. *Wilson*, 1524.

Rhododendron rigidum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 233 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 29.

SZECHUAN. *Wilson*, 3947.

Rhododendron rubiginosum, *Franch.* in *Bull. Soc. Bot. France* xxxiv. 282 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 30.

YUNNAN. *G. Forrest*, 2050, 2097.

Rhododendron siderophyllum, *Franch.* in *Journ. de Bot.* xii. 262.

YUNNAN. *A. Henry*, 9110A ; *Wilson*, 3950 ; *G. Forrest*, 507.

Rhododendron moupinense, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 233.

SZECHUAN. *Wilson*, 3937.

Rhododendron dendrocharis, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 233.

SZECHUAN. *A. Henry*, 8857 ; *Pratt*, 396 ; *Wilson*, 3938.

Choniastrum.

Rhododendron Hancockii, *Hemsl.* in *Kew Bull.* 1895, 107 ; *Hook. Ic. Pl.* t. 2381.

Yunnan. *A. Henry*, 10,523a, 10,523b.

Rhododendron stamineum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 236 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 30. R. pittosporifolium, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 29. R. aucubifolium, *Hemsl.* in *Journ. Linn. Soc.* xxvi. 19, quoad flores ; folia *Daphniphylli macropodi* !

Hupeh. *A. Henry*, 5787, 6432 ; *Wilson*, 758, 5140.

Rhododendron oxyphyllum, *Franch.* in *Journ. de Bot.* xii. 264.

Yunnan. *A. Henry*, 259, 331, 11,609.

This is very closely allied to, if not the same as, *R. Westlandii*, Hemsl.

Rhododendron Wilsonae, *Hemsl. et E. H. Wils.* ; species *R. Westlandii* simillima, differt imprimis bracteis floriferis angustis acutis.—W. B. H.

Bush, 1–2 m. high ; branches slender, straight, greyish, glabrous. *Leaves* pseudo-verticillate, ovate-lanceolate, excluding petioles 7–10 cm. long, 2–4 cm. broad, glabrous, acuminate, base more or less cuneate, shining green, reticulate above, pallid beneath ; secondary veins prominent on both surfaces ; petioles about 1 cm. long. *Buds* elongate-acuminate ; scales reddish-brown, scarious, ovate to oblong, largest about 2 cm. long, acute. *Flowers* solitary on each scaly peduncle ; peduncles clustered, forming fascicles of 4 or more at ends of shoots, flesh-pink, 4–6 cm. across ; the peduncles enclosed by sheathing bud-scales, erect-spreading, about 2 cm. long, glabrous. *Calyx* annular, truncately 5-toothed, glabrous ; teeth unequal, short, rounded or acuminate. *Corolla* deeply 5-lobed ; tube narrowly funnel-shaped, about 1 cm. long ; lobes nearly three times as long as the tube, erect-spreading, elliptic, rounded. *Stamens* about ten, as long as corolla-lobes ; filaments unequal, longest 3·5 cm. long, curved, slightly villous in the lower half ; anthers nearly globular. *Pistil* just over-topping the stamens ; ovary slender, about 7 mm. long, glabrous, shining, reddish-brown ; style curved upwards, glabrous ; stigma capitate, flattened. *Capsule* cylindric, about 3 cm. long, 0·5 cm. broad, deeply furrowed, brown.

Hupeh. In woods at 1700–2000 m. above sea-level, *Wilson*, 317.

One of the most beautiful and distinct of Chinese Rhododendrons. Named in compliment to my wife.—E. H. W.

Rhododendron Tutcherae, *Hemsl. et E. H. Wils.* ; inter species sectionis '*Choniastrum*' staminibus inclusis ob ramulos floriferos et folia setulosa distinctum.—W. B. H.

Tree, 13 m. high (*Henry*) ; branches straight, setose until two years old ; bark grey. *Leaves* clustered at ends of shoots, subcoriaceous, lanceolate, excluding petiole 8–11 cm. long, 1·5–3 cm. broad, acuminate, base cuneate, glabrous above, setulose beneath, midrib impressed above, very prominent beneath, secondary veins raised on both surfaces ; petioles about 1 cm. long, setose. *Flowers* in axillary fascicles of three or more, clustered in such a way as to form a terminal truss of 12 or more flowers, violet (*Henry*), 5 cm.

across ; pedicels erect-spreading, about 1·5 cm. long, reddish, very sparsely setose. *Calyx* minute, truncately 5-toothed, glandular ; teeth often unequal, very short, acute. *Corolla* deeply 5-lobed ; tube about 1 cm. long, narrow, nearly cylindric ; lobes three times as long as tube, spreading, elliptic, obtuse, more rarely rounded, usually with tiny apical tufts of white hairs. *Stamens* about ten, exserted but shorter than corolla-lobes ; filaments tomentose in lower half. *Pistil* over-topping stamens ; ovary slender, 0·5 cm. long, clothed with short, white, appressed hairs ; style reddish, glabrous ; stigma large, dark-coloured. *Fruit* not seen.

YUNNAN. Mountains south of Mengtsze, in forests at 2000 m., *A. Henry*, 10,636.

Named in compliment to the wife of my friend Mr. W. J. Tutcher, of Hongkong, to whom I am indebted for assistance and kind hospitality during my several visits to the island.

The section *Choniastrum*, Franch., in which the flowers arise either singly or in fascicles from the axils of the uppermost leaves, instead of being strictly terminal, also includes *R. Henryi*, Hance, and *R. Westlandii*, Hemsl. All the species have very beautiful flowers.—E. H. W.

OSMOTHAMNUS.

Rhododendron micranthum, *Turcz.* in *Bull. Soc. Nat. Mosc.* 1837, n. vii., 155 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 27 ; *Bot. Mag.* t. 8198.

HUPEH. *A. Henry*, 6632 ; *Wilson*, 1526.

Rhododendron rufescens, *Franch.* in *Journ. de Bot.* ix., 397.

SZECHUAN. *Wilson*, 3930, 3931. YUNNAN. *G. Forrest*, 2182.

Rhododendron fastigiatum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 234 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 23.

SZECHUAN. *Pratt*, 267 ; *Wilson*, 3936, 3936A.

Rhododendron flavidum, *Franch.* in *Journ. de Bot.* ix. 395. R. primulinum, *Hemsl.* in *Gard. Chron.* xlvii. (1910), 4.

SZECHUAN. *Pratt*, 521 ; *Wilson*, 1773, 3932.

Cultivated specimens, which have recently flowered with Messrs. James Veitch & Sons at Coombe Wood, prove that *R. primulinum*, Hemsl., is not a distinct species.

Rhododendron Wongii, *Hemsl. et E. H. Wils.* ; ab *R. flavido* foliis majoribus, floribus majoribus eburneis, et calyce parvo haud petaloideo recedit : *R. concinno* etiam simile sed foliis minoribus apice rotundatis, florum colore et corolla intus extraque glabra differt.—W. B. H.

Bush, 1–2 m. high ; branches twiggy, lepidote when young. *Leaves* elliptic or ovate-elliptic, excluding petiole 2–3 cm. long, 1–1·5 cm. broad, apiculate, very dark shining green, lepidote above, grey, lepidote beneath ; petioles 3–4 mm. long, lepidote. *Buds* ovoid, acute ; scales obovate or spathulate, concave, rounded, apiculate, ciliate. *Flowers* in fascicles of three or more, cream-coloured, about 3 cm. across ; pedicels slender, erect-spreading, 8–10 mm. long, lepidote. *Calyx* saucer-shaped, lepidote, 5-toothed ; teeth

about 1 mm. long, orbicular, ciliate. *Corolla* deeply 5-lobed ; tube funnel-shaped, about 1 cm. long, pubescent inside ; lobes elliptic, about 1·5 cm. long, spreading, rounded. *Stamens* about ten, shortly exserted ; filaments unequal, 1·5 2 cm. long, villous in lower half. *Pistil* longer than stamens ; ovary about 3 mm. long, furrowed, densely lepidote ; style filiform, sparsely pubescent at base, slightly thickened below stigma. *Fruit* not seen.

SZECHUAN. Neighbourhood of Tatienlu, on scrub-clad mountain sides, at 3650 m. above sea-level, *Wilson*, 3948.

Named in compliment to Mr. Y. C. Wong, of Ichang, Central China, a cultured Chinese gentleman, who rendered me signal services during the whole of my stay in China.—E. H. W.

Rhododendron polycladum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 234 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 29.

SZECHUAN. *Wilson*, 3935B. YUNNAN. *G. Forrest*, 4149.

Rhododendron blepharocalyx, *Franch.* in *Journ. de Bot.* ix. 396.

SZECHUAN. *Pratt*, 254 ; *Wilson*, 3929.

Rhododendron fragrans, *Maxim. Rhod. As. Or.* 16 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 23.

SZECHUAN. *Pratt*, 660.

Rhododendron polifolium, *Franch.* in *Journ. de Bot.* ix. 397.

SZECHUAN. *Pratt*, 787.

Rhododendron trichostomum, *Franch.* in *Journ. de Bot.* ix. 396.

SZECHUAN. *Wilson*, 3933.

Rhododendron intricatum, *Franch.* in *Journ. de Bot.* ix. 395 ; *Hemsl.* in *Gard. Chron.* 1907, xli. 262, f. iii. ; *Bot. Mag.* t. 8163.

SZECHUAN. *Wilson*, 3934.

Rhododendron nigro-punctatum, *Bur. et Franch.* in *Journ. de Bot.* v. 95.

SZECHUAN. *Faber*, 483 ; *A. Henry*, 8897 ; *Pratt*, 802 ; *Wilson*, 3935, 3935A.

GRAVEOLENTES.

Rhododendron brachyanthum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 234 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 20.

YUNNAN. *Monbeig*, 9.

Rhododendron emarginatum, *Hemsl. et E. H. Wils.* ; species distincta fruticosa valde ramosa, ramis gracilibus, foliis parvis subverticillatis obovatis emarginatis simul apiculatis, floribus solitariis (an semper ?) graciliter pedicellatis.—W. B. H.

Bush, 60 cm. high (*Henry*) ; branches spreading (*Henry*), ? prostrate, twiggy, verruculose. *Leaves* pseudo-verticillate, obovate, excluding petioles 3–4 cm. long, 1·5–2 cm. broad, rounded, emarginate, mucronulate, base narrowed to the petiole ; upper surface dark green, sparsely lepidote when young ; lower surface pallid, lepidote ; midrib and secondary veins immersed above, very prominent beneath ; petioles 3–5 mm. long, lepidote. *Buds* ovoid, acute ; scales ovate, acute, ciliolate, very sparsely lepidote. *Flowers* solitary or in pairs (always ?), yellow (*Henry*), about 1 cm. across ; pedicels erect, 2 cm. long, lepidote. *Calyx* annular, 5-toothed ;

teeth minute, unequal, obtuse. *Corolla* campanulate, 5-lobed, lepidote outside; lobes short, spreading, rounded. *Stamens* ten, included; filaments broad, about 5 mm. long, villous about the middle, glabrous at base. *Pistil* over-topping stamens; ovary 2 mm. long, furrowed, densely lepidote. *Fruit* not seen.

YUNNAN. Mountains south-west of Mengtsze, at 2000 m. above sea-level, *A. Henry*, 9166.

Very distinct from all other Chinese species. From the material before us we think the species may be prostrate in habit.—E. H. W.

Rhododendron Mariesii, *Hemsl. et E. H. Wils.* in *Kew Bull.* 1907, 244; *Bot. Mag.* t. 8206.

KIANGSI. *Maries.* HUPEH. *A. Henry*, 5274.

Rhododendron mekongense, *Franch.* in *Journ. de Bot.* xii. 263.

YUNNAN. *Monbeig*, 7; *G. Forrest*, 698.

TSUSIA.

Rhododendron villosum, *Hemsl, et E. H. Wils.*; species distinctissima, etsi *R. Championae* adspectu simillima, ab eo foliis floribusque lepidotis, pilis omnibus eglandulosis, floribus minoribus et calyce parvo diversa.—W. B. H.

Bush, 1–6 m. high, much-branched, branches twiggy, sparsely lepidote, densely setose when young, becoming glabrescent with age. *Leaves* clustered at ends of shoots, lanceolate or oblong-lanceolate, excluding petiole 4·5–11 cm. (usually 7–9 cm.) long, 2–3·5 cm. broad, short or long acuminate, apiculate, base slightly auricled or cuneate, usually setulose on both surfaces (rarely pubescent beneath), becoming glabrescent with age; sparsely lepidote above, more densely so beneath; midrib slightly immersed above, very prominent and villous beneath; secondary veins raised on upper surface; petioles 5–8 mm. long, villous. *Buds* ovoid; scales short, orbicular, apiculate, sometimes ciliolate. *Flowers* three or more, subumbellate, light to dark-purple, 3·5–4·5 cm. across; pedicels erect-spreading, 1–1·5 cm. long, pilose. *Calyx* saucer-shaped, 5-toothed, densely villous; teeth short, sub-orbicular, rounded, ciliate, reddish. *Corolla* deeply 5-lobed, sparsely lepidote; tube narrow, funnel-shaped, 1·5–2·5 cm. long, more or less villous outside; lobes about as long as tube, spreading, elliptic, rounded or obtuse. *Stamens* about twelve, shortly exserted; filaments slender, 2–3·5 cm. long, densely pilose below middle but glabrous at base. *Pistil* over-topping stamens; ovary narrow, 4–7 mm. long, densely lepidote; style filiform, glabrous, very rarely sparsely lepidote. *Capsule* cylindric, lepidote, sparsely setulose, about 2 cm. long, ·5 cm. across, furrowed.

SZECHUAN. In thickets and thin woods, at 2300–3650 m. above sea-level, *Wilson*, 3944, 3945, 3946.

The three numbers were gathered in different localities at varying altitudes; they differ somewhat in size of leaves and in degree of hairiness of leaves and shoots.—E. H. W.

Rhododendron indicum, *Sweet*, *Brit. Fl. Gard.* ser. 2, t. 128; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 25.—Azalea indica, *Linn. Sp. Pl.* ed. 1, 150.

Szechuan. *Wilson*, 5143. Yunnan. *A. Henry*, 9900E.

Rhododendron microphyton, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 235 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 28.
Yunnan. *A. Henry*, 12,983 ; *G. Forrest*, 4172.

Keysia.

Rhododendron spinuliferum, *Franch.* in *Journ. de Bot.* ix. 399.
Yunnan. *A. Henry*, 10,572, 10,619.
This species was founded on Delavay's n. 4883, which is in the Kew Herbarium under another, unpublished, name. It has recently flowered in the collection of Mr. M. L. de Vilmorin, at des Barres.

Rhodorastrum.

Rhododendron oleifolium, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 235 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 28.
Yunnan. *G. Forrest*, 4132, 4133, 4170.

Rhododendron racemosum, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 235 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 29 ; *Bot. Mag.* t. 7301.
Yunnan. *G. Forrest*, 2009, 2207, 4134.

Rhododendron spiciferum, *Franch.* in *Journ. de Bot.* ix. 400.
Yunnan. *A. Henry*, 9369, 9369A ; *G. Forrest*, 512.

Rhododendron scabrifolium, *Franch.* in *Bull. Soc. Bot. France* xxxiii. 236 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 30 ; *Bot. Mag.* t. 7159.
Yunnan. *Hancock*, 154.

Azaleastrum.

Rhododendron ovatum, *Planch.* ex *Maxim. Rhod. As. Or.* 45 ; *Hemsl.* in *Journ. Linn. Soc.* xxvi. 28.—Azalea ovata, *Lindl.* in *Journ. Hort. Soc. Lond.* i. 149 ; ii. 126, t. 2 ; *Bot. Mag.* t. 5064.
Hupeh. *Wilson*, 719.

XVII.—AN ATTEMPT TO INTRODUCE OLEARIA SEMIDENTATA INTO THE BRITISH ISLES.

(With Plates.)

A. A. Dorrien-Smith.

Captain A. A. Dorrien-Smith, who has just returned from an expedition to Western Australia, New Zealand, and Chatham Island, has sent the following account of his experiences in Chatham Island for publication in the *Kew Bulletin*. Captain Dorrien-Smith has brought home to the Scilly Islands a large number of interesting plants, but he informs us that, owing to the heat experienced on the voyage from Monte Video to lat. 10° N., the Chatham Island plants suffered severely and only a very small proportion managed to survive.

"I left Lyttelton, New Zealand, on Dec. 1st, 1909, at 10 p.m. in a small steamer capable of steaming about 9 knots under very favourable circumstances, in order to cover the 476 knots of Southern Pacific Ocean which separates the Chatham Islands from the main land. Our course lay about E. by N., and from the very start we met a strong head wind which lasted more or less the whole way across, but, after a good bucketing lasting 3 days 12 hours, we at last sighted through the mist some land rising sheer out of the sea and arrived soon afterward in the Port of Weitangei. It was a dull, thick, misty day when we arrived and it soon turned into deluges of rain. As we approached the small wharf and let go the anchor in three and a half fathoms of water, just outside the kelp and within a biscuit-throw of the cliff, I noticed that we had steamed into a very large bay surrounded by sand dunes. At first the place seemed deserted; but presently people began to arrive, a few on foot but most on horseback, and as far as the eye could see came knots of cantering horsemen along the beach accompanied by a swarm of dogs, each man or woman seemed to have at least six, until at last there must have been 60 or 70 horses and about 300 dogs all collected on the beach to await the landing of the mails, &c.

"Capt. Allsop, who commanded our vessel, and who had been most kind to me on the voyage across, kindly introduced me on landing to the inhabitants of the place. Everywhere I was most hospitably received and everyone was anxious to learn my mission and what they could do for me, a point which I was not long in explaining; so having secured a room at Mr. Odman's hotel on the beach (there are two hotels) I was directed to Mr. F. A. D. Cox's house some two miles off and kindly lent a horse to get there. I had been in communication with Mr. Cox for some years, through the kindness of Dr. L. Cockayne and others, and as he is the living authority on the Chatham Island flora I was most anxious to meet him. After fording the Weitangei river at its mouth and then crossing the sand dunes, my way lay across a fine grass flat, which comprises the race course, and beyond this, on some rising ground a short distance further, I came to the house, Whangamarino, where I was most hospitably received and where I eventually stayed for the remainder of my visit to the islands.

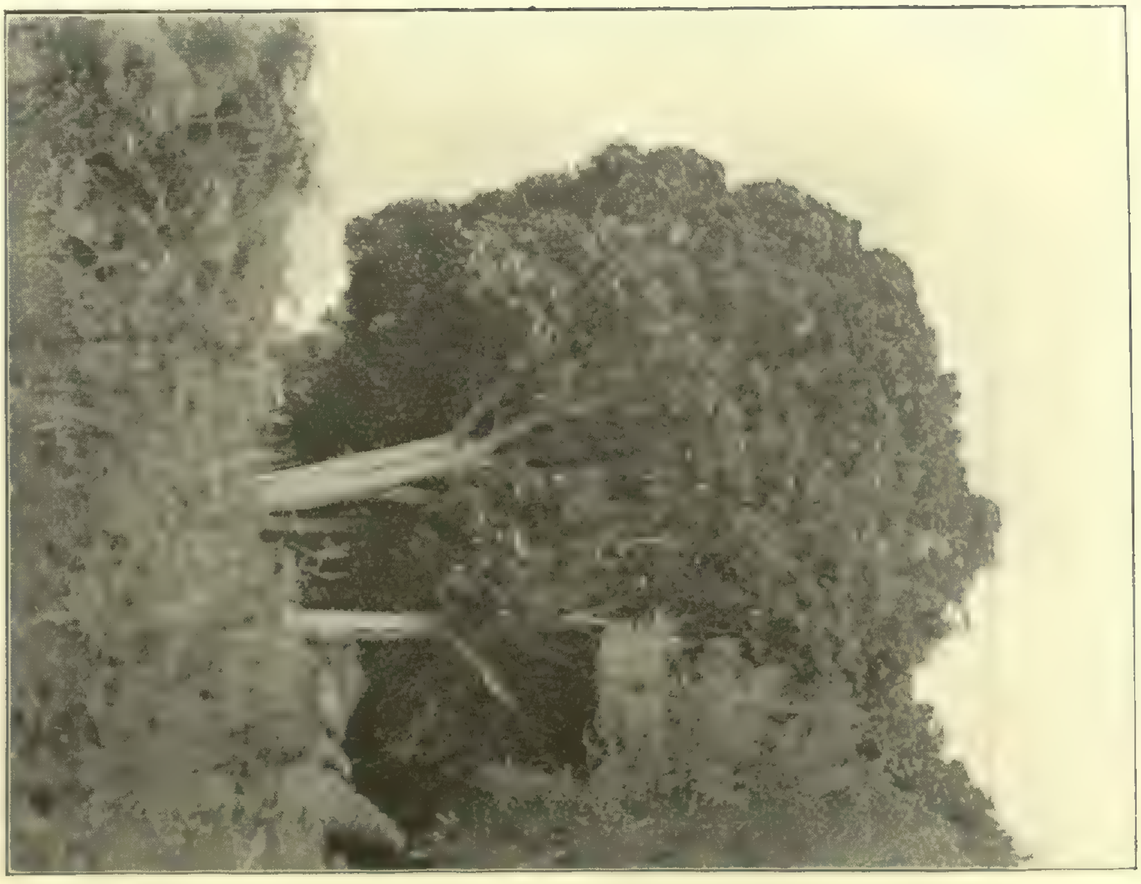
"The Chatham Islands are composed of two large islands and several rocks and islets. Chatham Island itself is by far the largest, with an area of about of 230,000 acres or about 30 miles long, and Pitt Island of about 15,000 acres; they lie on either side of 44° S. lat., some small islands of the group being known as the Forty-fours. They were inhabited in the early days of European settlement in New Zealand by the Moriori, a peaceful black race practically unversed in the art of war, until the Maoris came and ate them. I believe only nine remain at the present day.

"Dr. L. Cockayne in the Trans. N. Z. Inst., vol. xxxiv, gives a very good account of these islands and special reference should be made to his paper for an account of their flora.

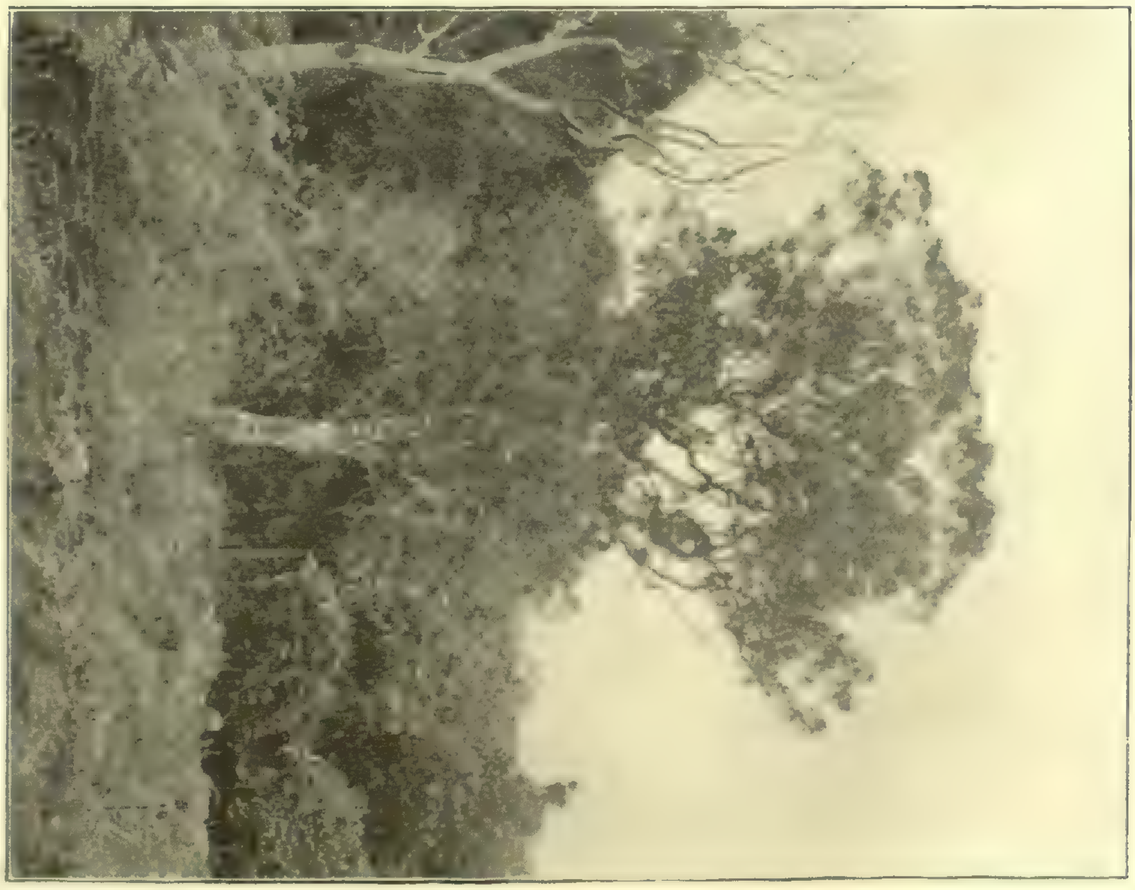
"I found during my visit that the climate is particularly 'soft,' indeed, from the statistics collected by Messrs. Cox and Shand, the average rainfall seems only to be about 30 inches, while it 'damps' on an average, 190 days in the year. The temperature is very

mild, a degree or so of frost only being registered in the winter months, and, on the whole, I should say that the climate is very similar to that of the south-west coast of Ireland. The islands are of volcanic origin ; Chatham Island itself is made up of two large masses of land joined together by a narrow isthmus composed of limestone. Blown sand forms an important physical feature of the island and, to some extent, has caused in it also the formation of a huge inland lagoon some 40,000 acres in extent, by cutting off a large area of shallow sea. Close to this lagoon there is a large freshwater lake, Lake Huro, which drains the country bordering the great lagoon to the south, and has a swampy outlet to the south into the Weitangei river, and there are several other freshwater lakes. The south end of the island contains the larger mass of land and rises to nearly a thousand feet above sea-level in a succession of peaty, boggy undulations ; the higher one ascends the worse the bogs become. The slopes adjacent to the sea-coast, therefore, are the only parts under pasturage, and what there is of it is excellent, and probably as fertile as that in any part of New Zealand itself.

"But to return to the day of my arrival in the island ; being more or less wet through after my ride to Mr. Cox's house, and as it was still pouring with rain, I took the opportunity to visit the swamp on the shore of Lake Huro, which is adjacent to the house. In the wettest part I found only various forms of swamp plants such as *Leptocarpus simplex* and *Carex appressa* var. *sectoides*, with here and there *Phormium tenax* ; but as soon as the swamp became the least bit drier one came upon the lowland forest, first *Coprosma propinqua*, then *Suttonia Coxii*, with more flax, and *Arundo conspicua*, while further in one found plenty of *Olearia Traversii*, *Pseudopanax chathamicum*, *Coprosma chathamica* and *Suttonia chathamica* ; *Dracophyllum arboreum* also occurs, and a very fine *Astelia*, which Mr. Cheeseman refers to as *A. nervosa*; I picked some leaves of this as much as 8 feet long, and gathered living specimens of the various species of *Carex* for Dr. Cockayne. On the edge of this swamp I saw my first 'Routine' (*Senecio Huntii*); this is a fine plant resembling in its mature state *Senecio Stewartiae* of the Snares Islands, but differing considerably in its juvenile form. I returned to the hotel for the night, having completed my ducking in the swamp, and arranged to examine the forest at the back of Whangamarino with Mr. Cox on the following day. On joining Mr. Cox at his house I found that there had been 75 parts of rain and it was still damping. About 11 o'clock it eased off, and we started on horseback to the back of the run, to collect some small plants of *Senecio Huntii* ; this we did without much difficulty, and examined the forest which is most interesting and differs entirely from the forest of the mainland. On the island the trees grow to no great height (20 feet to 25 feet) and the tops are kept well in order by the wind and form a compact mass. I saw some fine trees of *Veronica gigantea*, 20 feet high, in full flower, and *Senecio Huntii* just coming into flower. The commonest trees about this part were *Corynocarpus laevigata* (the Karaka), *Coprosma chathamica*, *Hymenanthera chathamica*, *Olearia Traversii*, *Corokia macrocarpa*, *Pseudopanax chathamicum* and *Suttonia chathamica*. The



PSEUDOPANAX CHATHAMICUM.



VERONICA GIGANTEA.

[*To face page* 122.

PLAGIANTHUS BETULINUS VAR. CHATHAMICUS.
CORYNOCARPUS LAEVIGATA.

General View of Olearia semidentata Bog.

OLEARIA SEMIDENTATA.

To face page 123.]

native pepper, *Piper excelsum*, was fairly common and the whole was entwined with endless Supple Jacks (*Rhipogonum scandens*), while I saw at least five varieties of tree ferns, *Cyathea dealbata*, *C. medullaris*, *C. Cunninghamii*, *Dicksonia antarctica* and *D. squarrosa*, and a few *Raphiostyles sapida* dotted about. The floor of the forest is covered with moss and lichens especially on the dead stumps, while filmy and other ferns abound. We also visited a sphaguum bog close by and obtained a bag of moss for packing up the plants. The sphaguum patches were colonized by several plants, chiefly *Gleichenia dicarpa* and some *Pteris esculenta*, and I was much struck with the lovely little *Pratia arenaria* which seemed to grow anywhere and everywhere, and closely resembles the well-known *Pratia angulata*, so lovely on moist rockeries at home. Some months previously Mr. Cox had collected several plants of *Olearia semidentata* and *Styphelia robusta*, which had become established in his garden and were growing well, and it is due to his kindness in collecting them for me that I was able to leave with a large number of both of these plants. I was interested to see some fine plants of *Olearia chathamica* growing there and also a fine plant of *Olearia Lyallii*, introduced from Ewing Island in the Auckland Island group, as well as other of the native trees. Dr. Cockayne was anxious to obtain seedling forms of *Veronica giguntea*, and these I found about the shrubberies : in form they are very different to the mature trees, the leaves being larger and covered with downy hairs while the stems are of a reddish-purple colour.

I was now anxious to get farther afield towards the Horns at the southern part of the island, and was fortunate in finding Mr. W. Jacobs, who volunteered to accompany me. It had rained 15 parts during the day, and the next morning broke thick and foggy, delaying our start, but we got away on horseback about 9 a.m. and travelled south, our destination being Mr. Blyth's place, about 15 miles off. The track, for there are no roads, lay over the higher country, undulating and boggy with occasionally a deep ravine through which flowed a small river considerably swollen by the rains. The country over which we passed was covered with *Pteris esculenta* (the Bracken fern) some *Phormium tenax*, *Dracophyllum arboreum* and *Styphelia robusta* in the drier parts, while *Dracophyllum paludosum* occupied the more swampy ground. The fog was fairly thick, and I could get no general view of the island, and it was so boggy that we constantly had to dismount and lead over the bad places, while at the best the horses were nearly up to their hocks in the peat. After some time we came across *Olearia semidentata* in full flower ; it is a beautiful sight, covered with its purple daisy flowers like a glorified Michaelmas Daisy : the ray florets are light mauve and the centre is a dark purple. Masses of plants were to be seen, the largest being about 3–4 ft. high, and in places where patches had been burnt seedlings were coming up in thousands. I endeavoured to photograph some of them, but it was most difficult in the wind and fog. A peculiar kind of rush-like grass, *Lepyrodia Traversii*, seems to grow in association with *Olearia semidentata* and greatly helps to harden the bog and make it easier to walk about on. The beautiful

Epacrid *Dracophyllum paludosum* was also in full flower, and the white patches made a lovely contrast with the *Olearia* and the brilliant red berries of *Styphelia robusta*, a combination which existed on the edges of the drier ground. At last we came to a lonely steep gully full of bush, including tree ferns and *Senecio Huntii* in abundance, where we halted for lunch and where in spite of the fog I was able to obtain some good photographs. Eventually we arrived at the Te Tuku gully—very steep and precipitous—across which a bad track led. The gully at the mouth where we crossed is about 600 ft. high, about half-a-mile wide, and covered with bush. When we arrived at Mr. Blyth's house, about 4 o'clock, I explained to him that my mission was to obtain specimens of a rare plant (*Aciphylla Dieffenbachii*) which I had heard grew on the cliffs near his house, and he immediately led me to the spot. It was growing on the precipitous slopes of the cliffs, which are here 600 ft. high, one flowering plant only being accessible, which we obtained. The edge of the cliff was covered with *Phormium tenax*, long grass, some *Astelia nervosa*, *Veronica chathamica*, more erect than the type, and the lovely little pink or white flowered *Geranium Traversii*, while on a ledge of the cliff below I noticed some of the ordinary forest trees, also a mass of *Myosotidium nobile* (the Chatham Island Lily) and the giant nettle *Urtica australis*. I also found *Olearia chathamica* in abundance growing on the cliff a little farther along; also *Senecio lautus* and *S. radiolatus*. Through the kind hospitality of our hosts we stayed at Te Tuku the night, with the promise of more *Aciphylla Dieffenbachii* the next day. Sure enough, on a small detached cliff-island some two miles on our way back, Mr. Blyth showed me a quantity of it growing, and I was able to take good photographs and get some specimens and plants. Unfortunately only the male plants were still in flower, the females having already gone to seed. This was most disappointing, because Mr. T. F. Cheeseman in his Flora is inclined to agree with Mr. Kirk in considering that it will ultimately form the type of a new genus; but hitherto no flowering specimen of the female has been obtained. The plant is very scarce except in patches in inaccessible places, and is said to occur also on Pitt Island in places similar to where I found it. It is probable that it is a good deal scarcer than formerly, since it must have suffered from the depredations of cattle, which eat it readily wherever they can get at it. Other plants are similarly threatened with extinction, namely, *Myosotidium nobile*, *Phormium tenax* and *Aciphylla Traversii*.

"The weather continued foggy and damp all this time, but when we were nearly back again at Weitangei it cleared and came out a glorious evening, so that I was able to get a view at last. When next morning broke, however, it was as bad as ever, and it rained in torrents all that day and continued throughout the next, making it quite impossible to get about the country. On the 11th it seemed finer and I started off with Mr. Cox to visit the shores of the Great Lagoon (Te Whanga) and the country between it and Lake Huro. Growing on the low limestone cliffs bordering the lagoon I found *Styphelia Richei* (which does not occur in New Zealand, but is found again in New South Wales), *Styphelia robusta*, *Sophora tetraptera* (Koi), *Phormium tenax*, *Linum monogynum*, *Geranium*

[*To face page* 124.

ACIPHYLLA DIEFFENBACHII.

OLEARIA SEMIDENTATA VAR. ALBIFLORA.

To face page 125.]

Traversii, *Veronica Dieffenbachii* and *Samolus repens*, the latter a lovely little creeper, which like *Salicornia* seems to like a place where the salt spray can reach it. The *Samolus* resembles the plant found in New Zealand, but is altogether a finer thing and probably deserves the distinction of var. *chathamicus*. The country between the lagoon and Lake Huro, and especially along the lagoon coast, is very pretty and park-like, and the forest trees growing close together form woods ; here *Corynocarpus* reaches a maximum height of 45 ft. with a stem thick in proportion, and the other forest tree are all larger than I had before seen them ; in these woods occurs *Plagianthus chathamicus*, referred by Cheeseman to *P. betulinus*. It appears to differ in having larger flowers and foliage ; and as the small-leaved form of the mainland is not present in the Chathams, it seems reasonable to follow Dr. Cockayne and call it *P. chathamicus*. Before getting home we were wet through again ; but during the morning I managed to get some photographs shewing *Veronica gigantea*, 20 feet high. Thus ended the first seven days of my visit, the total rainfall being 3·10 inches, with only once a glimpse of the sun. The 12th was spent in getting dry and in packing the plants, but I got wet again after a short excursion into the Lake Huro swamp in search of *Carex*. In the evening our steamer, which had been dodging round the island as well as visiting Pitt Island, collecting wool all the week, appeared on the scene, but as I soon learned from the captain that he had yet two more days' work down the coast and loading at Weitangei, I started off with Mr. Cox on the 13th, which was fine and calm, for what is known as the Tobacco country. This district is so called not because it grows tobacco ; but because it was once purchased for a few cigars. It is the country lying southward and comprises the highest ground, worst bogs and greatest quantity of *Olearia semidentata* ; the place of all others I was longing to get to, but up till now quite impossible owing to the bad state of the weather. The way first led through fine pasturage and patches of lowland forest including a very fine patch of *Cyathea Cunninghamii* ; out on the moorland we saw *Dracophyllum arboreum* and *Styphelia robusta*—a bush of the latter standing isolated attracted my attention more than 200 yards off by the scarlet colour of its berries After crossing a fine gully, in which was *Senecio Huntii*, the giant groundsel, in full flower, the ground about a mile further on became wetter and *Dracophyllum paludosum*, tiny plants a mass of flower, appeared ; soon came *Olearia semidentata*, at first odd plants, then in masses, acres and acres of it everywhere and in full flower, and presently we found *Olearia chathamica* scattered about, and next came to a large bog all yellow with sphagnum and green apparently with water cress, patches of flax here and there, and also *Carex appressa* var. *sectoides*. Here we halted for lunch and I discovered several bushes of an entirely white form of *O. semidentata*, unknown to Mr. Cox ; he also found a lovely pink variety. Through the bog flowed a small stream, and it seemed there would be a difficulty in obtaining water to wash down our sandwiches ; but on getting nearer I discovered the supposed water cress to be a mass of *Marchantia cephaloscypha* and that one could walk on it everywhere, as it formed a crust over the surface of the bog. On

going farther across the bog I was surprised to find a very large area of this Liverwort nearly an acre in extent, growing on a considerable slope, so much so that one could slide on it. The ground at its edges was some feet higher, irregular, and covered with *O. semidentata* ; it immediately gave me the idea of a glacier, the lateral moraines being formed by the *Olearia*. I obtained several photographs of this remarkable formation which I called the "glacial bog" as a distinction from the *Olearia-Lepyrodia* bog. The day was fine throughout and by far the most enjoyable one I had spent on the island ; we returned early in order that I might pack the plants obtained, which included one nice plant of the white variety of *O. semidentata*. The 14th was spent in embarking the plants and re-packing them into a Wardian case which I had on board, and we sailed in the evening about 6 p.m., reaching Lyttelton on 17th just in time to catch the evening boat to Wellington, where I left the plants ready to bring them to England on the 30th December. Thus ended a very rough but interesting trip, in which I was very greatly assisted by the kindness and hospitality of the inhabitants of the Chatham Islands. My thanks in particular are due to Mr. Cox and Mr. Alec. Shand."

XVIII.—DIAGNOSES AFRICANAE : XXXV.

1081. **Brachylaena Hutchinsii**, *Hutchinson* [Compositae - Inuloideae] ; a *B. huillensi*, O. Hoffm., foliis lanceolatis vel oblanceolatis basi longe attenuatis, et a *B. Merana*, Baker, foliis petiolis et paniculis minoribus differt.

Arbor, 27–30 m. alta, cortice laevi pallide cinereo fere albo ; ramuli floriferi late sulcati, juniores pallide tomentelli. *Folia* lanceolata vel oblanceolata, apice sensim et acute acuminata, basi in petiolum acute attenuata, 4·5–10 cm. longa, 1–2·5 cm. lata, tenuiter coriacea, supra parce lanata, demum glabra, arcte reticulata, subtus lanato-tomentosa, nervis lateralibus utrinque 10–11 subtus elevatis arcuatis prope marginem divaricatis, venis subtus plerumque inconspicuis ; petioli usque ad 7 mm. longi, lanati. *Paniculae* lanatae, in axillis foliorum saepius delapsorum apices versus ramorum dispositae ; ♂ laxae pedunculatae, ♀ densae, subsessiles ; bracteae oblongae, obtusae, 2·5 mm. longae. *Capitula* ♂ breviter pedicellata, circiter 12-flora. *Involucri bracteae* 3-seriatae, extus parce lanatae, intus concavae, glabrae et nitidae ; exteriores ovato-lanceolatae, obtusae vel subacutae, 2·5 mm. longae, 1 mm. latae, interiores oblongo-lanceolatae, subacutae, dorso leviter carinatae, 4 mm. longae, 1·25 mm. latae. *Achaenii rudimentum* brevissimum. *Pappi setae* valde inaequales, minute barbellatae, usque ad 3 mm. longae. *Corolla* tubulosa, ad medium 5-lobata, glabra ; tubus 2 mm. longus, lobis linearibus subacutis. *Stylus* integer, apice subclavatus. *Capitula* ♀ subsessilia, circiter 5-flora. *Involucri bracteae* quam ♂ paulo majores. *Achaenia* oblonga, subteretia, 5 mm. longa, 1·5 mm. diametro, pilosa. *Pappi setae* 2-seriatae, minute barbellatae, exteriores 4 mm. longae, interiores 6 mm. longae. *Corollae tubus* cylindricus, 5 mm. longus, glaber, lobis 5 inaequalibus usque ad 1 mm. longis. *Stylus* exsertus, teres, bifidus, glaber.

Tropical Africa. British East Africa : Nairobi, *Battiscombe*, 27, 54 ; *Hutchins*.

The species is named in compliment to Mr. D. E. Hutchins of the British East African Forestry Department.

Mr. E. Battiscombe has supplied the following information regarding this tree : Native name "Muhugu" ; Ibean Sandal Wood ; a tall tree, 90-100 feet high in the forests, at an elevation of 5000–6000 feet ; occurs also in the coast forests ; bark smooth, light grey to almost white, peeling off in long narrow shreds. Timber white, hard, easily worked, scented when freshly cut ; splits easily, durable and not eaten by termites. Weight 60 lbs. per cubic ft. when air-dried ; no visible heartwood, annual rings and medullary rays not visible. Crown thin, confined to upper fourth of the stem ; branches upright, not spreading.

1082. **Macaranga Paxii**, *Prain* [Euphorbiaceae - Crotoneae] ; affinis *M. Zenkeri*, Pax. sed foliis longius acuminatis, parce sed persistenter pilis longiusculis albis subtus secus nervos obsitis, stipulis majoribus, bracteis masculis minoribus obtusis crenatisque differt.

Frutex vel *arbuscula*, ramis glabris hinc inde spinis rectis ad 8 mm. longis armatis. *Folia* longe petiolata, ovata, 10–20 cm. longa, 7·5–10 cm. lata, longe acuminata, basi 3-nervo rotundata deinde pennivenia, margine argute grosse dentata, membranacea, juniora pubescentia praesertim subtus, aetate supra glabra, subtus parce pilis albis induta ; petiolus 7·5-10 cm. longus, glaber ; stipulae ovatae, acutae, margine ciliatae, 2·5–2·7 cm. longae. *Flores masculi* in paniculas laterales 10 cm. longas, ramis plurimis 2·5 cm. longis dispositi ; rhachis minute lepidoto-puberula ; bracteae suborbiculares, obtusae, grosse crenatae, florum fasciculos subtendentes. *Alabastra* globosa, minuta, puberula. *Stamina* saepissime 2, raro 1. *Flores feminei* ignoti.

Tropical Africa. Lower Guinea : Cameroons ; Yaunde, *Zenker & Staudt*, 106.

Very nearly related to *M. Zenkeri*, Pax, and its allies *M. monandra*, Muell.-Arg., and *M. togoensis*, Pax, but readily distinguished from all three by its larger stipules and its crenate, not dentate, bracts, which are much smaller than in *M. Zenkeri* or *M. monandra*, but in size much resemble those of *M. togoensis*.

1083. **Macaranga Rowlandii**, *Prain* [Euphorbiaceae-Crotoneae] ; species *M. Barteri*, Muell.-Arg., quam maxime affinis, sed petiolis brevioribus et foliis basi manifeste cuneatis differt.

Arbuscula, ramis glabris inermibus. *Folia* petiolata, oblanceolato-oblonga, 7·5–10 cm. longa, 3·75–4·5 cm. lata, breviter abrupteque acuminata, margine integra, basi cuneata, utrinque glabra, supra viridia subtus pallidiora et glandulis parce obsita, pennivenia ; petiolus 2–3·5 cm. longus ; stipulae lanceolatae, caducae. *Flores masculi* in paniculas laterales angustas 3·75 cm. longas ramis 4-6 mm. longis dispositi ; rhachis glabra vel minute parce puberula ; bracteae ovatae, cuspidatae, breve dentatae, minute puberulae, 5 mm. longae. *Flores feminei* ignoti.

Tropical Africa. Upper Guinea : Western Lagos, *Rowland* ; Gold Coast, *Farmar*, 454.

Very nearly allied to *M. Barteri*, but smaller in all its parts and readily distinguished by the truly cuneate leaf bases which do not form two small auriculate lobules, with usually a distinct gland on their upper surface, which characterise the leaf bases of *M. Barteri*.

1084. **Tragia** (**Tagira**) **Benthami**, *Baker* [Euphorbiaceae-Crotoneae]; species *T. cordifoliae*, Vahl, affinis sed segmentis calycis feminei pancioribus—utrinque 2–3 nec 6–10—facillime distinguenda.

Caulis elongatus, volubilis, gracilis, glaber vel parce hispidus. *Folia* longe petiolata, 5–10 cm. longa, 3·5–5 cm. lata, acuta, argute dentata, basi saepissime alte cordata, membranacea, utrinque parce hispida; stipulae ovato-lanceolatae. *Racemi* laterales terminalesque, breviter pedunculati, 3–5 cm. longi; alabastra mascula globosa, 1 mm. lata; bracteae ovatae vel lanceolatae. *Flores feminei* 1–2. *Sepala* 6, viridia, matura 8 mm. longa, dense hispida; rhachis anguste lanceolata segmentis linearibus utrinque 2–3. *Styli* dimidio inferiore connati. *Capsula* hispida, 8 mm. lata; cocci globosi.—*T. cordifolia*, Benth. in Hook. Fl. Nig. 501; Muell.-Arg. in DC. Prodr., xv. 2, 944; Hiern, Cat. Afr. Pl. Welw. 984; nec Vahl.

Tropical Africa. Upper Guinea; Ashanti, *Cummins*; Fernando Po and Cape Coast, *Vogel*; Cameroons, *Mann*, 1255; *Zenker & Staudt*, 516; Abeokuta, *Millen*, 80. Nile-land; Uganda, *Dawe*, 5. Lower Guinea: Angola, *Monteiro*; Loanda, *Gossweiler*, 427: Golungo Alto, *Welwitsch*, 381. Mozambique Dist.: Nyasaland; Namasi, *Cameron*.

1085. **Sebastiania inopinata**, *Prain* [Euphorbiaceae-Crotoneae]; species americanae *S. multirameae*, Mart., quam maxime affinis et ab ill. Muellero cum ejus varietate *Luschnathiana* conjuncta, differt tamen foliis magis acuminatis, filamentis brevioribus basi distincte connatis.

Frutex, 2·5–3·5 m. altus, undique glaber, ramis gracilibus patulis teretibus. *Folia* breviter petiolata, ovata vel elliptico-ovata, distincte acuminata, basi rotundata, eglandulosa, margine integra, subcoriacea, 6-8 cm. longa, 3–4·5 cm. lata, supra subnitida, subtus pallidiora, nervis utrinque circiter 6; petiolus 6–8 mm. longus. *Spicae* axillares, 1·5 cm. longae, multirameae, graciles, cylindraceae; bracteae masculae ovatae, acutae, margine undulatae, 3–5-florae. *Calycis* lobi 2 vel 3, suborbiculares, margine undulati. *Stamina* 2 vel 3, filamentis brevibus connatis.—*S. multiramea* var. *Luschnathiana*, Muell.-Arg., in DC. Prodr., xv. 2, 1177 partim et quoad spp. Africana tantum.

Tropical Africa. Upper Guinea: Cameroons; banks of the Cameroon River, *Mann*, 755, 2225; Bipinde, *Zenker*, 3225.

This species is so like and so closely allied to *Stillingia Luschnathiana*, Baill. (*Sarothrostachys Luschnathiana*, Kl.), that the late Dr. Mueller has treated it as identical with that Brazilian plant, which he further considers to be a variety of *Sebastiania multiramea*, a species widely spread in that country. The leaves of the African plant differ very little in shape from those of its Brazilian ally, but they are more rounded at the base, have a more distinctly prolonged acuminate apex and rather fewer pairs of lateral nerves. The differences in the male flowers of the two, however, render it advisable to keep them apart. The female flowers of the African species have not yet been communicated.

1086. **Kniphofia Wyliei**, *N. E. Brown* [Liliaceae]; affinis *K. pauciflorae*, Baker, sed foliis scapo aequilongis, floribus numerosioribus confertis lacteis et pedicellis duplo brevioribus differt.

Folia 30–45 cm. longa, 3–5 mm. lata, linearia, acuta, glabra, marginibus laevibus. *Scapus* cum racemo 8–10 cm. longo folia subaequans. *Bracteae* 5–6 mm. longae, concavo-ovatae, acutae, patentes vel deflexae, membranaceae. *Flores* plus minusve deflexi. *Pedicelli* 1–1·5 mm. longi. *Perianthium* anguste infundibuliforme, supra ovarium leviter constrictum, lacteum; tubus 1·3–1·4 cm. longus; lobi 2 mm. longi, ovato-oblongi, obtusi. *Stamina* haud exserta, antheris nigris.

S. Africa. Zululand; at an altitude of between 600 and 900 m., *Wylie in Herb. Wood*, 8996.

1087. **Schoenoxiphium filiforme**, *Kükenthal* [Cyperaceae-Cariceae]; species ab omnibus hujus generis inflorescentia ad spiculam unicam reducta et spiculis partialibus demum divaricatis vel ima decurvato-reflexa toto coelo diversa.

Laxe caespitosa. *Culmi* plures, 15–25 cm. alti, filiformes, subincurvi, obtuse trigoni, laeves, inferne vaginis aphyllis brunneis costatis et foliis paucis obsiti. *Folia* culmo breviora, filiformi-convoluta, marginibus apicem versus minute scabra, pallide viridia, stricta, rigida. *Spicula* unica terminalis (raro altera sterilis, distans, bractea brevi vaginante suffulta adest) ebracteata, florens in ambitu oblonga, fructifera ovata, 6–12 mm. longa, pauci- et laxiflora. *Spicula* partialis terminalis ♂, laterales 3–5 androgynae (rarius abortu uniflorae ♀), 4–6 mm. longae, primo oblique patentes, demum divaricatae vel ima decurvato-reflexa, sessiles. *Squamae* lanceolatae, acuminatae, ferrugineae, e carina viridi plerumque aristulatae, demum caducae. *Prophyllum* squamam excedens, oblongo-ellipticum, 3·5 mm. longum, obtuse trigonum, pallide virens, multicostatum, glabrum, basi spongiosum, marginibus ad $\frac{2}{3}$ vel in spiculis ♀ fere usque ad apicem connatis, in rostrum conspicuum ferrugineum ore albo-hyalino oblique sectum postice bifidum attenuatum. *Nux* oblongo-elliptica, 2·5 mm. longa, trigona, lateribus concavis. *Styli* basis conica, decidua. *Stigmata* 3, mediocriter longa. *Rhachilla* secundaria complanata, viridis, binervis, apice non auriculata, nuce brevior.

S. Africa. Cape Colony: Summit of Great Winterberg, under rocks, 2570 m., *Galpin*, 5605.

The discovery of this species supports my view that the evolution of the Caricoideae has started from *Schoenoxiphium* (*see* Kükenthal, in Engler's Pflanzenreich, Heft 38, 1909, p. 24). This becomes especially evident if we compare *Schoenoxiphium filiforme* with *Carex microglochin*. Both species have the same habitus, the same filiform-convolute leaves, the same simple inflorescence. Both possess utricles which become deflexed as they mature, and both have in common a morphologically very important character, namely, early deciduous female scales. Thus the only essential difference left is in the perfect formation of the partial spikelets in *Schoenoxiphium filiforme*: a basal fertile ♀ flower and several ♂ flowers, the later terminating an elongated secondary axis, whilst in *Carex microglochin* the ♂ flowers are suppressed and the secondary axis is reduced to a

rudiment. In these circumstances it appears necessary to divide the genus *Schoenoxiphium* into two subgenera which may be characterised as follows :

A. *Galpinia* Kükenthal.—Spicula unica terminalis ebracteata. Spiculae partiales demum divaricato-reflexae. Squamae caducae..

B. *Eu-Schoenoxiphium* Kükenthal.—Spiculae plures spicatim vel paniculatim dispositae bracteatae. Spiculae partiales oblique patentes. Squamae persistentes.

1088. **Aristida Galpinii**, *Stapf* [Gramineae-Stipeae] ; affinis *A. Burkei*, Stapf et *A. bipartitae*, Rupr. & Trin., ab utraque habitu paniculae et dimensionibus spicularum partium distincta.

Herba perennis, dense caespitosa, innovationibus numerosis cum culmis floriferis arcte fasciculatis ; culmi circiter 25 cm. alti, graciles, laeves, glabri, 1-nodi, internodiis exsertis. *Folia* praeter ligulas et vaginarum ora glabra, pallide viridia ; vaginae arctae, inferiores pallidae, paulo compressae, persistentes, ad ora pilis ad 4 mm. longis tenuissimis barbatae, summa saepe violascens, glabra ; ligulae brevissimae, ciliolatae ; laminae angustissimae, lineari-setaceae, acutae, 10–15 cm. longae, explanatae 1 mm. latae, rigidae vel subflexuosae, plicatae, subtus laeves, supra aspero-puberulae. *Panicula* subcontracta, oblonga, laxa, flexuosa, 2–2·5 cm. longa ; rhachis ramique filiformes ; rami distantes, solitarii, infimi 3–4 cm. longi (spiculis demptis), ad 1 cm. indivisi, 4 vel uti caeteri tantum 2-spiculati ; pedicelli scaberuli, inaequales, longiores circiter 6–10 mm. longi. *Spiculae* 10 mm. longae, stramineae et luride purpereo-variegatae. *Glumae* inaequales, lineari-lanceolatae, subito vel sensim acutatae et mucronulatae, inferior 6–8 mm. longa, superior circiter 10 mm. longa. *Valva* lanceolata, vix rostrata, cum callo brevi barbato ad 9 mm. longa, laevis nisi in dorso subrotundo asperula, purpurascens, haud cum arista articulata ; aristae setiformes, oblique divergentes, intermedia ad 2 cm. longa, laterales paullo breviores.

S. Africa. Cape Colony : Barkly East Division ; Ben McDhui (Wittebergen), 2820 m., *Galpin*, 6900.

1089. **Agrostis subulifolia**, *Stapf* [Gramineae-Agrosteae] ; inter species africanas nulli arcte affinis, foliis subuliformibus innovationum in caespitem congestarum et panicula aperta rigidula parva distincta.

Herba perennis, dense caespitosa ; culmi stricte erecti, graciles, 18-20 cm. alti, nodo unico suprabasali, internodio longe exserto ; innovationes numerosi, arcte congesti, vaginis emarcidis obtectae. *Folia* glabra, innovationum 4–6 ; vaginae arctae, tenues, striatae, apertae ; ligulae elongatae, 2–3 mm. longae ; laminae rigidae, plicatae, subulato-setaceae, obtusiusculae, 2·5–3 cm. longae, explanatae ad 0·8 mm. latae, 4–5-sulcato-striatae ; folium caulinum unicum, vagina 6–7 cm. longa, lamina 1·5–2·5 cm. longa. *Panicula* aperta, ambitu ovata, 5–6 cm. longa, rigidula ; rhachis ramique laeves ; rami geminati vel infimi 3–4-ni, obliqui, inaequilongi, ad 3·5 cm. longi, ad medium indivisi, uti ramuli pedicellique filiformes ; ramuli pauci, spiculas 3–1 gerentes ; pedicelli 3–1·5 mm. longi. *Spiculae* lanceolatae, acutae, e purpureo et stramineo variegatae, 3 mm. longae, glabrae laevesque. *Glumae* aequales, sub-3-nerves, nervis

lateralibus tenuibus brevibus, apice stramineo-hyalinae. *Valva* explanata, late ovato-oblonga, truncata, subhyalina, 2 mm. longa, glabra, inferne 5-, supra 4-nervis, nervis in mucronulos minutissimos excurrentibus tenuissimis, arista setiformi e medio orta valvam vix superante. *Palea* valvae subaequilonga, 2-nervis. *Rhachillae* continuatis obscura. *Anthera* 1·5 mm. longa. *Caryopsis* 1·5 mm. longa.

S. Africa. Cape Colony; Barkly East Division; damp slopes of Ben McDhui (Wittebergen), 2880 m., *Galpin*, 6911; in a marsh at the base of Doodman's Krans Mtn., 2550 m., *Galpin*, 6910.

1090. **Melica brevifolia**, *Stapf* [Gramineae-Meliceae]; affinis *M. racemosae*, Thunb. et *M. ovali*, Nees, ab utraque statura humili, foliis brevibus pro ratione latiusculis, inflorescentia racemosa et valvae inferioris parte hyalino magis producta pilos superante distincta.

Herba perennis; culmi floriferi 12–18 cm. alti, cum innovationibus 5–7 cm. longis e rhizomate praemorso fasciculati, erecti vel breviter ascendentes, multinodi, internodiis summis longe exsertis laevibus, basi tenues, tenaces. *Folia* perfecta supra culmorum bases congesta, infima fere ad vaginas arctas, summa ad squamas vaginantes bracteiformes reducta; vaginae arcte sulcato-striatae, scaberulae vel scabridae, reverse pilosulae, primo clausae, tandem magis minusve fissae; ligulae hyalinae, 0·5 mm. longae, antice in lobum latum obtusissimum productae, vaginae os cingentes, lobo antico demum in auriculas fisso; laminae lineares, superne longe attenuatae, acutae, 3–4 cm. longae, 3–4 mm. latae, planae vel superne involutae, rigidae, scabridulae, glaucae, nervis lateralibus utrinque circiter 7 supra prominentibus. *Panicula* ad racemum angustum circa 10–12 spiculatum secundum 3 cm. longum reducta, spiculis infimis geminatis caeteris solitariis; pedicelli 7–2 mm. longi, filiformes, longiores flexuosi, pubescentes. *Spiculae* stramineae, 7 mm. longae, anthoeciis fertilibus 2 vel 1. *Glumae* inaequales, inferior late ovata, breviter acuta, 4 mm. longa, 2·3–2·5 mm. lata, subhyalina, nervis lateralibus tenuibus brevibus utrinque 1–2, superior a latere visa oblonga, subacuminata acuta, 5·5–6 mm. longa, 2·5–3 mm. lata (explanata), scariosa, apice hyalina, scaberula, nervis lateralibus utrinque 2 ad medium attingentibus. *Valva* infima a latere visa suboblique lanceolata, latiuscule acuminata, 6·5 mm. longa, 9-nervis, nervis prominulis scabridis, ad latera pilosa, pilis 3 (inferioribus)—2 mm. longis, acumine hyalino; valva secunda praecedenti similis, nisi minor et interdum sterilis, glumam superiorem aequans vel subsuperans; valvae caeterae vacuae, parvulae, glabrae, in corpus obovoideo-globosum congestae.

S. Africa. Cape Colony: Fort Beaufort Division; mountain sides on Great Winterberg, 2220 m., *Galpin*, 5614.

This has the tufted and dwarfed growth and short racemose inflorescence that characterise *M. pumila*, Stapf, which comes from the same area; but it is readily distinguished by the broad leaves, larger spikelets and unequal glumes.

XIX.—MISCELLANEOUS NOTES.

Mr. T. F. Chipp, B.Sc. (*K.B.*, 1909, 424), has been appointed by the Secretary of State for the Colonies an Assistant Conservator of Forests in West Africa.

Botanical Magazine for April.—The plants figured are : *Typhonodorum Lindleyanum*, Schott (t. 8307) ; *Saxifraga Grisebachii*, Degen et Dörfl. (t. 8308) ; *Rhododendron Harrovianum*, Hemsl. (t. 8309) ; *Dipelta floribunda*, Maxim. (t. 8310) ; and *Cornus Nuttallii*, Audubon (t. 8311).

The *Typhonodorum* is an evergreen Aroid with a stout stem reaching a height of 10 ft., and long-stalked deeply cordate or sagittate leaves, of which the blade is sometimes as much as 3½ ft. long. Its spathe is 1½–2 ft. long, with a green tube and a yellow blade. The species is a native of Madagascar, and on account of its edible seeds it has been introduced into the Island of Johanna in the Comoros, into Mauritius, and it is believed also into Reunion. The Kew plant was presented in 1905 by the Royal Botanic Garden, Dahlem, Berlin. *Saxifraga Grisebachii*, from South East Europe, has encrusted basal leaves growing in a dense rosette, and reddish densely glandular-hairy stem-leaves with green tips. Its flowers have a reddish-purple calyx and purple petals. This species was introduced into cultivation in 1902. *Rhododendron Harrovianum* is a new species from Western China, whence seeds were sent to Messrs. James Veitch & Sons by Mr. E. H. Wilson. The species has proved to be one of the hardiest of those recently introduced from China. At Coombe Wood its somewhat small violet-purple flowers were produced for the first time in 1907. *Dipelta floribunda* is a very ornamental flowering-shrub belonging to the Caprifoliaceae, and is another of the numerous additions made to our gardens during the last few years by Messrs. Veith. The seeds of this plant were collected at altitudes of from 6500 to 8000 ft. above sea-level in Western China. *Cornus Nuttallii* is a native of Western North America, and has been in cultivation in the British Isles for the last 70 years. Its involucre is whitish and tinged with yellow or sometimes with pink, and measures up to 6 inches across. The flowering branch depicted in the Magazine was supplied by a Kew plant, which was purchased in 1904, and the fruit came from Mr. B. E. C. Chambers, of Haslemere, who possesses probably the finest plant grown in this country.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5. 1910.

XX.—NOTES ON THE BOTANICAL RESOURCES OF YOLA PROVINCE, NORTHERN NIGERIA.

J. M. Dalziel.

The following Report on the Flora and Economic Resources of Yola Province, Northern Nigeria, by Dr. J. M. Dalziel, has been sent to the Director by the Secretary to the Administration, Northern Nigeria. The report was accompanied by a large collection of plants representative of the vegetation of Yola Province. Three new species, *Cussonia nigerica*, Hutchinson, *Boswellia Dalzielii*, Hutchinson, and *Boswellia odorata*, Hutchinson, have been found in the collection and the descriptions are inserted in the Report. Some additional determinations of the plants referred to have also been added. It seems probable that the *Sansevieria* referred to on p. 139 is not *S. guineensis*, as this species is confined to a small area in the neighbourhood of Sierra Leone.

The province of Yola is the most easterly of the Benue provinces, and on the east and south borders on German Kamerun, while the 11th parallel of latitude nearly corresponds with the Yola-Bornu boundary on the north. The general geographical features are those of mountain ranges separated either by the bush savannah typical of the greater part of Northern Nigeria, or in much greater extent by low-lying plains and meadows, which become swamps during the rains.

A great variety of pagan tribes inhabit the various hill ranges, while the level tracts are rather sparsely populated by the somewhat degenerate and perhaps impure race of Adamawa Fulani, living for the most part in little scattered farm-villages, which in the more fertile districts become grouped in communities covering sometimes several square miles, and more rarely in unwalled towns, while the cattle breeding "borroro" maintain the traditions of the race by forming no permanent settlements but choosing their pastures with more or less regularity with the changing seasons.

(16417—6a.) Wt. 92—428. 1375. 6/10. D & S.

To the botanist the stretches of wooded bush and flat plain offer perhaps little that is not to be found in other riverine or landward provinces of Central Nigeria, but the absence of Hausa names for several trees and plants well known to the local Fulani suggests that the collection of plants prepared in this province may contain at least a few species not yet known to exist farther west or north.

As one travels southwards from Bornu towards the Benue an obvious difference in the arborescent vegetation of the bush presents itself, the preponderance of thorny acacias in the more northerly district giving place to broad-leaved trees in increasing degree within Yola Province. Gum acacias are still abundant, however, and the larger species continue to be conspicuous trees both north and south of the river, across the Anglo-German boundary, and into Muri Province on the west.

From a commercial point of view there are at present only two vegetable products which are important and valuable enough for export, viz., Gum and Shea Kernels (*Butyrospermum Parkii*, Hausa, "Kedanya," Fufulde, "Karehi"), which after collection by Fulani and pagans alike, or bartered from the latter, are brought in considerable quantities to the trading companies' stores. These are, however, less a product of native industry than an evidence of their natural abundance, and the facility with which they can be procured and fetch a market price with a minimum of labour. The Niger Company's store at Yola alone received over 400 tons of butter-nut kernels during the months of August and September, 1909, to which should be added the quantity which arrives at the German firm, while, in addition, the store of the former company at Nafada on the Gongola naturally exploits the resources of Yola Province as well as of Bauchi and parts of Bornu.

Gum, which is the predominating forest product of Bornu and of the northern Hausa provinces, is also an important asset on the upper Bornu and its tributaries. I have made frequent enquiries to find if possible exactly which species of tree yields each variety of gum sold to the European firms. Unfortunately for such an attempt the leather bag or calabash of a native gum collector in the bush generally contains pieces differing in colour and appearance, which have been dislodged by means of a long stick or spear from any species of gum-yielding tree abounding in his district, and any sample may thus contain the products of several species. The culture of gum as carried out in Kordofan and Sudan is entirely unknown in Nigeria, the collection being done at random at any time and in the most desultory fashion. Three varieties are recognised and accepted by the Niger Company under the following names:—"Falli," "Marrua" and "Mumuye." These are originally place or district names, and are not referable in any definite degree to gums of any single species of acacia or other genus. Falli is a place name in the Gongola district, and the gum which arrives at the Niger Company's store at Nafada is chiefly of this variety. Thus, out of 1,500 cases received there this year, 1,300 were "Falli." In Yola, on the other hand, most of the gum received is "Mumuye," with a certain amount of "Marrua" and less "Falli." Marrua is a district in German Adamawa, and Mumuye is the name of a pagan tribe near the Anglo-German

boundary in Muri Province, but it must be said that samples of gum bearing these names are not necessarily gathered in these districts, which have in the course of trade operations afforded designations for different varieties of the article.

In general, any white or nearly colourless gum is called "Falli"; the tinted varieties, yellow or reddish, are classed as "Marrua," while "Mumuye" gum is usually in lumps or masses of a dark smoky colour. "Falli" and "Marrua" gums are in the form of large tears or pear-shaped pieces, lumps, broken fragments and occasionally pencils. Both are clear on fracture, but the surface of a piece of "Falli" gum usually becomes finely fissured, with a loss of transparency, while "Marrua" gum as a rule retains a glassy surface.

As to the botanical sources of each of these varieties, one might suspect that "Falli" gum is largely the product of *Acacia Senegal*, and this is doubtless true in part at least. This grey-barked acacia, the "hashab" of Kordofan, is abundant enough in the northern provinces, though even there it is rarely more than a shrub or small tree. Its Hausa name is "dakwora" (Fufulde, "dibehi"), its gum is often almost colourless, and is a known forest product exported from Bornu and the north as "kolkol" gum, and it may possibly be the chief species supplying the "Falli" gum to Nafada. In Yola Province, however, *Acacia Senegal* is much less abundant than in the north, and is usually an inconspicuous shrub, while the tree which the natives point to as the chief source of "Falli" gum is the "fara-kaya" (Hausa, "white-thorn"), more rarely called "bauji" in Hausa, and "alluki" in Fufulde. This is a large acacia with a spreading crown of dark foliage, pale scurfy bark, long white thorns and balls of white flowers. It is probably *Acacia albida*. Another species of acacia called "karkara" in Hausa (Fufulde "fitarlahi"), apparently also known in Hausa as "kumban shafu," or "parshin shafu," also supplies gum which ranks as "Falli." This is a tall tree with light coloured bark, spikes of white flowers, and branches armed with stout thorns. It is abundant in the north, and also on the Bornu road from Yola to Song, and is so far peculiar in habitat that one frequently finds it in small areas forming little groves by itself to the exclusion of most other species. The gum appears to be of a particularly agreeable quality, as native carriers may often be seen sucking either the gum or pieces of the bark along with "kanwa" or Bornu salt as a pleasurable diversion.

"Marrua" again appears to be properly the product of a single species which I have little doubt is *Acacia Senegal*, or the "Falli" of the Sudan. This, which is known in Hausa as "dussa," and in Fufulde as "bulbe" or "fulbe," is a shrub or small tree with yellow balls of flowers, narrow, curved and almost moniliform pods, and with the characteristic yellow or ochrey powder on the bark. It is common enough in Yola Province, as well as in the German colony, but it is not to be compared in abundance with some districts in the north, where the so-called "mimosa bush" is in places largely composed of this species alone. Doubtless also gum from the "gabbarua" (Fufulde "gabde"), *Acacia arabica*, and other species, and occasionally the less soluble gums from one or two species of

Albizzia, which are nearly as common in the province as the acacia, may at times be mixed with samples of the better varieties.

"Mumuye" gum on the other hand is derived from one or more species of *Combretum*, the usual source being a tree called in Hausa *"wiyan-demmu" or "chiriri." The "taramnia" or "taraunia" (Fufulde "buski"), *Combretum verticillatum*, and probably other species of *Combretum*, *e.g.*, the tree known as "zindi" (? Hausa or Kanuri name), also supply this variety. Another of the *Combretaceae*, *Anogeissus leiocarpa* (Hausa, "marike," Fufulde, "kojoli"), a tree with light graceful foliage and balls of pale flowers, yields a gum some of which is probably sent as "Mumuye," and the well-known *Sterculia tomentosa* (Hausa, "kukuki," Fufulde, "bobori"), yielding a sort of gum tragacanth, may also in some cases be similarly classed. The various species of the *Combretaceae* mentioned are all particularly abundant throughout Yola Province, and gum classed as "Mumuye" is obtained quite as much from Kombo and Shillem on the river Gongola and elsewhere as from districts south of the Benue.

Gum finds its application in many simple ways in native arts, *e.g.*, "finishing" dyed cloth, preparation of Mallam's ink, compounding of sweatmeats and other market comestibles, &c.

Two other species yield gum which so far as I am aware is not collected by the natives in this Province. One of these is the peculiar tree called "Takanda giwa" (Elephant's sugar-cane), *Cussonia nigerica*, the leaves of which drop off during the dry season, giving the bare branches, with their somewhat umbellate arrangement, the suggestive appearance expressed by its other designation of "Hanun Kuturu" or "Leper's hand." This exudes at wounded points a very clear colourless gum which hangs in slender pencils and appears to have some slightly irritant quality, as the tongue tingles a little when it is sucked.

This plant proves to be a new species the diagnosis of which is as follows :—

Cussonia (Eucussonia) nigerica, *Hutchinson*, sp. nov. ; affinis *C. Kirkii*, Seem. et *C. djalonensi*, A. Chev., ab illa foliis repando-dentatis et bracteis reflexis glabris, ab hac inflorescentiis elongatis simplicibus bracteis acuminatis glabris differt.

Arbor cortice corrugato, ramis subumbellatis dispositis (fide *Dalziel*). *Folia* ad apices ramorum conferta, longe petiolata, digitatim 6–foliolata ; petioli 10–30 cm. longi, graciles, subtiliter sulcati, glabri ; foliola sessilia, oblanceolata vel elliptico-lanceolata, ad basem longe et sensim attenuata, longe caudato-acuminata, acutissima, 7–14 cm. longa, 2–5 cm. lata, remote repando-dentata, parte infima cuneata integra excepta, dentibus rotundatis, tenuiter chartacea, glabra, subtus pallida, arcte reticulato-venosa, nervis lateralibus utrinque 11–15 arcuatis supra vix subtus leviter elevatis ; stipulae intrapetiolares cum petiolo basi adnatae, ovatae, acuminatae, circiter 1 cm. longae, ciliatae. *Inflorescentiae* spicatae, ad apices ramorum confertae ; spicae elongatae, circiter 30 cm. longae ; axis basi 5 mm. diametro, subteres, ad apicem sensim attenuata ;

* Meaning "neck of demmu," the latter being *Varamus exanthematicus*, a large species of lizard, from the characteristic fissuring of the bark.

bracteae triangulari-ovatae, acute acuminatae, 3 mm. longae, demum reflexae, glabrae. *Flores* non visi. *Fructus* ellipsoidei, leviter 4-costati, 8-mm. longi, 5 mm. diametro, exocarpio tenui fusco, pyrenis crustaceis extus spongiosis intus nitidis.

Tropical Africa. Northern Nigeria: Yola Province; Kilba, *Dalziel* (coll. 1909), 172.—Hausa name, "Takanda giwa."

The other species is a tree which I have not observed in the Hausa States, and for which I have never been able to ascertain a Hausa name. It is called in Fufulde "Tursuje," and is a tree of about 15 to 20 ft. at most, with pinnate leaves and pendulous racemes of plum-like, edible, acid fruit, turning red, purple or nearly black when ripe. It may possibly prove to be a species of *Odina*, as a piece of gum which I found on an injured tree was clear and nearly colourless but readily became brittle and friable when dried. The bark of this tree is said to be used by the Fulani in Nassarawa as a remedy for sleeping sickness.

The blood-red resin of *Pterocarpus erinaceus* (Hausa "Madobia," Fufulde, "Yinyamhi," or possessor of blood), is less esteemed by the natives than might be expected in a province where the species is particularly abundant. This tree, apart from its occasional use medicinally or perhaps like gum in glazing fabrics, and another species, *Pterocarpus lucens*, which I have not seen in other provinces, are chiefly valued for their excellent timber.

Daniella thurifera (Hausa, "Maje" and "Kadaura," Fufulde "Karlahi"), the usual source of West African copal, a tree which grows to a much greater size in the western and central parts of the Protectorate, such as Kontagora and Zaria, is not now tapped for its balsam for purposes of trade. This product is used as frankincense either alone or in combination with other resins to fumigate and impart an agreeable scent to clothing and to improve the atmosphere in the houses of the better classes during the rains. Thus "Karon Maje" (W. Afr. Copaiba balsam), along with the odorous resin of two new species of *Boswellia*, *B. Dalzielii* (Hausa, "Hararabi" or "Ararabi"), and *B. odorata* (Hausa, "Hanu"; Fufulde, "Andakehi"), and the very fragrant tuberous root of the rush "Kajiji" (*Juncus* sp.) abundantly cultivated in Bornu, are burnt while the wearer holds his garments open over the fumes. The shrub known as "Dashi" (Fufulde, "Badadek") has a similar use, but in this case the whole bark is powdered and burnt. The above mentioned species of *Boswellia*, though well known all over N. Nigeria, are exceedingly abundant in Yola Province, and are frequently planted as a fence and support to the Zana matting enclosing the compounds in native towns.

These two new species may be described as follows :—

Boswellia Dalzielii, *Hutchinson*, sp. nov.; ab omnibus speciebus adhuc descriptis foliis glabris argute serratis inflorescentiis elongato-racemosis valde distincta.

Arbor foliis post anthesin evolutis (fide *Dalziel*); ramuli crassi ad apices circiter 1 cm. diametro, cortice tenui deciduo. *Folia* imparipinnata, saepe 8-juga, glabra; rhachis 30 cm. longa, subteres, leviter sulcata, circiter 1·5 mm. diametro; foliola plerumque opposita, infima ovato-lanceolata, parva, intermedia et superiora elongato-lanceolata, apice sensim longe acuminata, basi cuneata,

inaequalia, 5–9 cm. longa, 1–2 cm. lata, membranacea, utrinque subnitida, grosse et argute serrata, serris circiter 3 mm. distantibus, nervis lateralibus utrinque 18–20 patulis vix prominulis. *Racemi* terminales, conferti, multiflori; pedunculus communis 15–25 cm. longus, glaber vel basin versus parce puberulus; pedicelli subfasciculati, patuli, graciles, 0·7–1·2 cm. longi, glabri; bracteae minutae. *Calycis segmenta* 5, ovato-triangularia, obtusa, 1 mm. longa, 1·25 mm. lata, subcoriacea, nisi margine puberulo glabra. *Petala* 5, leviter oblique elliptica vel oblongo-elliptica, apice obtusa et inflexa, 5 mm. longa, 3 mm. lata, venosa, margine minute glanduloso-puberula. *Stamina* 10; filamenta basi disci inserta, alterna brevioria, 2–2·5 mm. longa, basin versus sensim incrassata, glabra; antherae oblongae, 2 mm. longae. *Discus* annularis, crassus, undulate lobatus, minute puberulus. *Ovarium* 3-loculare, ovoideum, leviter trilobatum, 1·25 mm. diametro, glabrum; styli 3, connati, 1·5 mm. longi, glabri. *Fructus* clavatus, basi attenuatus, 2 cm. longus, superne 0·8 cm. diametro. *Semina* non visa.

Tropical Africa. Northern Nigeria: Kontagora, *Dalziel* (coll. 1906), 279 (flowering specimen); Katagum District, *Dalziel* (coll. 1908), 340 (fruiting specimen).—"Ararabi" or "Hararabi" of the Hausa tribe.

Boswellia odorata, *Hutchinson*, sp. nov.; affinis *B. papyriferae*, Hochst. et *B. Dalzielii*, Hutchinson, ab illa foliolis serratis longe acuminatis glabris, ab hac inflorescentiis paniculatis dense pilosis differt.

Arbor; ramuli crassi, cortice pallide fusco deciduo glabro. *Folia* imparipinnata, 6–9-juga; rhachis 30–40 cm. longa, subteres, sulcata, parcissime pilosa, 1·5–3 mm. diametro; foliola plerumque subalterna vel superioria opposita, infima lanceolata, minora, intermedia et superiora elongato- vel lineari-lanceolata, apice sensim longe acuminata, basi cuneata vel subrotundata, 5–10 cm. longa, 1–2 cm. lata, membranacea, serrata, serris circiter 4 mm. distantibus, nervis lateralibus utrinque circiter 12 patulis vix prominulis. *Paniculae* terminales, confertae, 20–30 cm. longae, dense pilosae; rami laterales racemosi, usque ad 14 cm. longi; pedicelli 5–8 mm. longi, patuli, demum subreflexi, canaliculati, pilosi; bracteae minutae, dense pilosae. *Flores* eis *B. Dalzielii* simillimi.

Tropical Africa. Northern Nigeria: Yola Province; commonly planted in towns, *Dalziel* (coll. 1909), 167.—Hausa name, "Hanu"; Fufulde, "Andakehi."

[A species of *Boswellia* (*B. chariensis*, Guillaumin) has recently been described as new, from specimens collected by Chevalier in Central Chari and Bagirmi; it seems, however, hardly distinguishable from *B. papyrifera*, Hochst.—J. H.]

Besides its application as a scent, the resin of these trees is used like gum along with the bark of the Verbenaceous tree "Denya" (Fufulde, "Galbiji") *Vitex Cienkowskii*, in compounding Mallam's ink and the tree is also apparently regarded as one of the many antidotes to arrow poison. Thus a decoction of the root, along with that of *Daniella thurifera*, is used in other provinces, but in Adamawa I have known the Fulani in emergency simply to chew

the fresh bark, and if vomiting takes place after a few hours, followed by recovery, the happy issue is attributed to this remedy in which they appear to place considerable confidence.

The only other forest product worthy of mention is rubber obtained from *Landolphia owariensss*, some of which finds its way in biscuit form to the Niger Company at Yola, but which is practically entirely a product of German Adamawa.

Arrow-poison here, as universally throughout N. Nigeria, is prepared from the seeds of *Strophanthus* (*S. hispidus* and *S. sarmentosus*, "kwankwanni" Fufulde, "Toke") as the sole indispensable ingredient, all other added substances vary in different localities, and no single one of them is essential. Even the "bijaje" mentioned by Barth in 1852 as the reputed arrow-poison of the Fumbina or people of Adamawa is only a secondary ingredient added to that obtained from *Strophanthus*. This "bijaje" I find is a species of *Ficus*, a tree with shining cordate acuminate leaves, and pale drooping branches like a "weeping ash," forming a picturesque object on the black granite borders of the Kilba and Marghi pagan hills in the northern part of the province. The splendid shade tree *Kigelia africana* (Hausa "Rahaina" and "Nonon giwa" *i.e.* "Elephant's breasts"; Fufulde, "Jirlahi"; Kanuri, "belongu"), with its huge pendulous cucumber-like fruits, becomes conspicuous on the Upper Benue and in the eastern provinces, while in parts of Bornu and north of Lake Chad it is said to replace the "Kuka."

In regard to fibre plants, Yola Province probably offers nothing new. A species of *Sansevieria* (Hausa, "Moda"; Fufulde, "Bessekoje"), one of the bowstring hemps, thrives well in a natural state in shady places throughout the province, and in the most northerly districts of the Protectorate, many hundred miles from the sea, and although its fibre is used, the plant is never cultivated. The tall *Hibiscus lunariifolius* (Hausa, "ramma," Fufulde, "gabbei") appears to be the only species cultivated definitely for fibre. The widely distributed and variable *Urena lobata* (sometimes called by the Hausa, "ka fi rama," *i.e.*, you surpass "ramma") is made use of, as also in emergency any of the taller species of Malvaceae, *e.g.*, "ramma kurumi" (*Wissadula rostrata*). Several wild species of *Hibiscus* with tall straight stems are stripped, and their bark is used as cordage, though the "kargo" (Fufulde, "berkeje") *Bauhinia reticulata*, perhaps the most abundant shrub in the Northern Nigerian bush, is the most commonly available for this purpose.

Securidaca longepedunculata (Hausa, "sainyia" and "uwar magunguna"; Fufulde, "alehi") is a common shrub in most parts of Northern Nigeria, but I have never known it to be used as fibre like the Buaze fibre from the same plant in Nyasaland. The second Hausa name means "mother of medicines," yet, although the root especially has many medicinal and more magical uses, it is difficult to find any really important application.

In Angola it forms one of the ingredients in an ordeal brew, and in this country there is a general belief amongst white men that it is a usual source of arrow poison; but I have only rarely found it to be so used even where the plant is plentiful, and then only as one amongst many additions to the essential *Strophanthus*.

In cultivation the Adamawa Fulani appears to be exceedingly indolent. Guinea corn is the staple cereal as compared with the millet of Bornu.

A serious epidemic affected this crop on the Gongola and Upper Benue in 1904, and was probably due to the same aphis as that found in the Sudan. One may not infrequently find certain fields where the leaves of guinea corn are covered with aphides and the characteristic sticky deposit, but this season I have also always found several varieties of their natural enemies, the lady birds, on the same plants. The sorghum bug (*Zygaeus militaris*, Fabr.) is also not uncommon, but is found on many other plants, particularly *Calotropis procera* ("tumfafia," Fufulde, "bamambeh"). Industrious Hausa or Fulani from other provinces facetiously remark that "rogo" or Cassava (Fufulde, "Mbai") is the chief crop of Adamawa because it is easy to grow, and there is some truth in the gibe. Wheat is rarely seen, but a fair amount of maize and rice is grown, although the latter grass does not grow wild in the South as in Bornu and Katagum, where it is sometimes gathered by the simple method of sweeping a calabash over the ripening grain. It cannot be denied that the cultivation of rice is greatly neglected in this province, where vast meadows remain moist throughout the year, and, at a low estimate, over half of its area is actually under water for several weeks between July and September. The extensive marsh between the Benue and the long ridge on which Yola town is situated, some two miles in width and many miles in length, is alone capable of supplying the province with this grain, a fact which was pointed out to the late Emir and his Chiefs by a party of Turkish exiles last year. From the deck of a river steamer, when the Benue is in flood, one cannot fail to see extending from the edge of the natural channel almost endless areas of grassy swamps, little cumbered by trees, and limited only by the range of hills some 10 to 15 miles distant, areas which would appear to offer illimitable possibilities for the growth of this cereal, which composes one-half the imports of tropical Africa. Rice, however, is regarded by the Fulani as an unsatisfying food, and they use the alluvial hollows after subsidence of the waters for planting a white grain in compact racemes, which is reaped about the end of January. An inferior variety of *Sorghum*, called "jigari," is the first article planted immediately on the definite advent of the rains, and this early maturing crop is unfortunately used, by Pagans at least, chiefly for the preparation of the intoxicating "peto," and, as a rule, only resorted to for food in the case of failure of the later crop of proper guinea-corn.

Sesamum indicum ("ridi" or "karkashi," Fufulde, "nome") is properly esteemed by the Fulani who make a sort of porridge of the seeds, called "marasiri." Various tubers add to the food supply both of the Fulani and of such Pagans as occupy the lower grounds, *e.g.*, the "gwaza" (Fufulde, "tandauje") *Colocasia antiquorum*? the taro of the east and of the Pacific; "tumuku" (Fufulde "metabela"), *Coleus dysentericus*, and "risga" (Fufulde, "bugumji"), *Syncolostemon* sp., both root tubers of plants of the *Labiatae*, and also curiously the large tap-root of *Tacca pinnatifida* (Hausa "giginiar biri" and "tara yayu," Fufulde, "bugulli"), which is

recognised as a food, but never cultivated as in southern seas. In some Fulani communities a girl at marriage brings to the new household, perhaps as evidence of her ability to undertake the cares of housekeeping, a large calabash of the prepared flour of each of the staple foods such as guinea corn, maize, &c., and the meal of this species is included in the list, from which one must suppose that its value as a food is better recognised by the Fulani than by the Hausas.

An unexpected find amongst the Batta Pagan tribe on the river was *Trapa bispinosa*. This floating plant, unknown so far as I have seen in the Hausa States, is called in Fufulde "birijin liam" (or "water arachis"), and appears to be cultivated in a sporadic manner by the riverine Pagan tribes in pools and marshes as it is in China and Tibet, the edible tuber being a sort of water caltrops.

The Pagan on his hills varies his culture slightly from that of the Fulani of the plains to suit the exigencies of his natural surroundings, but removal of his fear of a Fulani raid permits the extension of field operations beyond the immediate neighbourhood of the hill on which the village is placed. Guinea-corn and maize are cultivated where possible, the indispensable jigari for convivial purposes, obsequies of a chief and such festive occasions, and always a little cotton, even if only on their rock-stream declivities in pockets of soil laboriously carried from below to replace that yearly washed away by the rains from between the bases of the granite boulders. *Voandezia subterranea* ("kwaruru," or "gujia," Fufulde, "debbi") and *Arachis hypogaea* ("gedda," Fufulde, "biriji") can be grown on mere granite grit of gravel of the foot hills. "Aiya" (Fufulde, "watuje"), the small tuber of a species of *Cyperus*, is a staple food amongst the Pagans, and is cultivated also by their Mohammedan neighbours and former oppressors, who declare however that as a food it "does not fill the belly."

The Fulani who occupy permanent farming villages on the plains, between the river and the hills, live under rather miserable circumstances and appear to be worse off or less adaptive than their Pagan neighbours. The latter cultivate, in addition to guinea-corn, maize and ground-nut and also the yam-nut with only partial success, the tubers brought in by the mountain Pagans being comparatively small. The Fulani farmers grow sweet potatoes and cassava in place of yams, and in addition to a diet chiefly composed of the products of the cow, get some dried fish, or as a luxury kanwa or Bornu salt. To replace this necessary condiment both Pagans and the poorer Fulani use ashes prepared from various plants. Thus, on the plains the leaves of the "giginia" palm, (Fufulde, "dutbi") *Borassus flabelliformis*, and certain wild grasses which grow near the marshes, are burnt for this purpose, while the hill tribes being, as a rule, without the palm, use ashes from grass and the wood of some trees, *e.g.*, the shrub *Gymnosporia senegalensis*, ("namijin tsada" Fufulde, "tultulde"). The Verre and Chamba Pagans of both British and German Adamawa appear to supply the lack of fish by a soup made from rats, but being expert hunters they are seldom without the larger deer.

As pot-herbs any of the following may be found as ingredients for soup amongst both types of people—"okra," *Hibiscus esculentus*,

(Hausa, "kubewa," Fufulde, "baskoje," "takkei," soup of okra) which is, however, of sufficient value to be sent to town markets—"yakua," or "red sorrel" (Fufulde, "fulle") *Hibiscus Sabdariffa* —beans with their leaves—leaves of the kuka (Fufulde, "bokki") *Adansonia digitata*, with ground-nut oil and Sesamum leaf and seed.

To these cultivated plants are almost equally added parts of several wild species besides the "kuka" already mentioned, of which the following are the most used :—an Asclepiadaceous twiner "yadia" (Fufulde, "sokotoro") with viscid juice, the leaves of which are used all over the Protectorate in soup, or by the pastoral "borroro," boiled and pounded up with beans, the leaf of a large tree called "zuwo" (Fufulde, "wanko"), the young leaves of which are used in soup as well as a fodder for domestic animals, and lastly the bark of a shrub, *Grewia mollis* ("dargaza," Fufulde, "Kelli,") which is widely used as a food or as a thickening for soup.

Besides the small grass called "acha" (*Digitaria ternata ?*) which is cultivated much more widely in the central provinces, and the "tamba," *Eleusine coracana ?*, which is also sometimes cultivated, a number of wild fodder grasses are used for human food in time of scarcity. Some of these are :—"tumbinjaki" (etym. "donkey's belly," probably because unwholesome to donkeys if fed on it too long), *Paspalum scrobiculatum*, a sort of "hungry rice," the seeds of which may not infrequently be seen being ground like cultivated grain in riverside markets of the Bashima and Batta tribes on the Benue ; "burburwa" or "komaiya," *Eragrostis tremula* ; "gude-gude," *Dactyloctenium aegyptiacum*, probably only used in famine ; "baia," *Panicum* sp. near *P. albidulum* ; "tuji," *Eleusine indica*, and others of which I can at present only give the native names, "Zarikia," "Sabbe" and "aburo" or "ibiru."

XXI.—NEW LAURACEAE FROM THE MALAYAN REGION. I.

J. S. Gamble.

Cryptocarya Wrayi, *Gamble* [Lauraceae-Cryptocaryeae]; affinis *C. densiflorae*, Blume, sectionis *Caryodaphne*, sed foliis percoriaceis orbiculari-ovatis vix 7 cm. longis margine cartilagineis differt.

Arbor parva, ramulis puberulis paullo angulatis. *Folia* percoriacea, ovata vel orbiculari-ovata, apice vix acuta, basi truncata ; 5–7 cm. longa, 4–5 cm. lata ; supra glabra, nitida, infra glauca, minute puberula, margine cartilaginea ; 3–costata, costis lateralibus infra apicem desinentibus, nervis costae mediae utrinque 2–3, reticulatione obscura infra areolata ; petioli crassi, 5–10 mm. longi. *Cymae* paniculatae, terminales vel axillares, fulvo-pubescentes, ad 3 cm. longae, pedicellis brevissimis, bracteis deciduis. *Perianthii* tubus infundibularis, 1·5 mm. longus ; lobi tubum aequantes, orbiculares, intus ad faucem villosi. *Stamina* ordinum I et II 1·5 mm. longa, connectivo acuto, filamento crasso villoso ; ordinis III breviora, connectivo obtuso; staminodia ordinis IV triangulari-acuminata, 1 mm. longa, breviter stipitata; glandulae glabrae, 0·5 mm. longae, breviter stipitatae. *Ovarium* ovoideo-cylindricum, stylo tenui,

stigmate brevi capitato. *Drupa* depresso-globosa, glabra, obscure sulcata, ad apicem lobis perianthii persistentibus ornata, 1·5 cm. longa, 2 cm. diametro. *Semen* drupae conforme, testa membranacea, cotyledonibus crassis.

Malay Peninsula. Perak; at Gunong Bubu, Larut, 1500 m., *Wray*, 3853.

Cryptocarya bracteolata, *Gamble* [Lauraceae - Cryptocaryeae]; species sectionis *Eucryptocaryae* foliis infra caeruleo-glaucis, siccitate albis, et panicularum bracteis et bracteolis linearibus insignis.

Arbor mediocris, ramulis teretibus minute griseo-puberulis, cum innovationibus et inflorescentia fulvo-tomentosis. *Folia* coriacea, ovata vel elliptica, apice obtuse acuminata, basi cuneata; 10–18 cm. longa, 4–8 cm. lata; supra parce lucida, glabra, infra caeruleo-glauca, siccitate alba, in costa et nervis fusco-puberula; nervis utrinque 6–8, nervulis transversis irregularibus et reticulatione subprominente junctis; petioli 1–2 cm. longi, torti. *Paniculae* terminales vel axillares, nigrescentes, tomentosae, foliis multo breviores, ad 5 cm. longae, bracteis et bracteolis linearibus ad 1 cm. longis, pedicellis 1–2 mm. longis. *Perianthii* tubus infundibuliformis, ad 5 mm. longus, superne incrassatus; lobi oblongi, rotundati, 3·5 mm. longi. *Stamina* ordinum I et II connectivo obtuso et filamento villoso, ordinis III connectivo acuto; staminodia ordinis IV cordato-acuminata, apice penicillata; glandulae rotundatae eximie stipitatae. *Ovarium* cum stylo gracili glabrum, stigmate capitato. *Drupa* nigra, glabra, depresso-globosa, 15 mm. longa, 18 mm. diametro, apice conspicue perianthio persistente munita. *Semen* drupae conforme, testa membranacea, cotyledonibus crassis, hemisphericis.

Malay Peninsula. Perak; near Larut on hills, 150-450 m., *King's Collector*, 6732, 7521.

Cyrptocarya Scortechinii, *Gamble* [Lauraceae - Cryptocaryeae]; species *C. Wightianae*, Thw., affinis, sed drupa oblongo-ellipsoidea crassiore praecipue differt.

Arbor ad 24 m. alta, trunci diametro ad 50 cm., ramulis angulatis puberulis, innovationibus fusco-pubescentibus. *Folia* coriacea, elliptica, elliptico-oblonga vel elliptico-lanceolata, apice plus minusve acuminata, basi attenuata; 10–20 cm. longa, 5–10 cm. lata; supra nitida, glabra, infra purpureo-grisea vel purpureo-glaucescentia, in costa et nervis pubescentia; nervis utrinque 6–9, nervulis transversis distantibus paucis et reticulatione prominente junctis; petioli crassi, 1–2 cm. longi. *Paniculae* ramosae, terminales vel axillares, ad 20–25 cm. longae, minute griseo-fusco-pubescentes, bracteis et bracteolis ovato-lanceolatis pubescentibus, pedicellis 1 mm. longis. *Perianthii* tubus infundibuliformis, 1·5 mm. longus; lobi ovati, tubum aequantes, intus puberuli. *Stamina* ordinum I et II antheris apice rotundatis, filamento villoso, ordinis III antheris apice cristatis; staminodia ordinis IV cordato-acuminata, dorso villosa; glandulae rotundatae, glabrae, parum stipitatae. *Ovarium* lanceolatum, glabrum, stylo gracili. *Drupa* oblongo-ellipsoidea, apice truncata, glabra, 3 cm. longa, 10–15 mm. diametro, exocarpio crasso rugoso. *Semen* oblongum, acutum, testa membranacea, cotyledonibus carnosis.

Malay Peninsula. Perak; at Thaiping, *Ridley*, 2966; at Gunong Haram, *Scortechini*, 568, 619; near Larut up to 1500 m., *King's Collector*, 6281, 6297, 6298, 6871, 8686, 10895. Sungei Ujong, *Ridley*, 5849.

Cryptocarya areolata, *Gamble* [Lauraceae-Cryptocaryeae]; species *C. amygdalinae*, Nees, affinis, foliorum nervulis et reticulatione prominulis differt; a *C. Scortechinii*, Gamble, praecipue differt paniculis brevioribus etiam foliorum reticulatione.

Arbor ad 20 m. alta, trunci diametro ad 50 cm., ramulis crassis, angulatis, fulvo-pubescentibus sicut innovationes et inflorescentia. *Folia* coriacea, ovata vel elliptico-ovata, apice obtusa vel obtuse acuta, rarius acuminata, basi cuneata (saepe inaequaliter), supra glabra, lucida, areolato-reticulata, infra purpureo-glauca; 10–20 cm. longa, 5–8 cm. lata; costa et nervi pubescentes, costa crassa, nervi utrinque 5–10, distantes, nervulis gracilibus, paralleli et reticulatione areolata conspicue juncti; petioli curvati, 2 cm. longi. *Paniculae* cymarum terminales vel axillares, fusco-pubescentes, ramosae, ad 15 cm. longae, bracteis et bracteolis ovato-lanceolatis caducis. *Perianthii* tubus cylindricus, 1·5 mm. longus; lobi ovati, aequales, 2·5 mm. longi, intus pubescentes. *Stamina* ordinum I et II antheris cristatis et filamentis villosis; ordinis III longiora prominenter cristata; staminodia ordinis IV sagittata, acuminata, basi et dorso villosa; glandulae magnae, rotundatae, villoso-stipitatae. *Ovarium* cylindricum, stylo gracili et stigmate capitato. *Fructus* non visus.

Malay Peninsula. Perak; at Sungei Larut, *Wray*, 2456; on low ground up to 250 m., *King's Collector*, 6017, 6171, 8630.

Cryptocarya bubongana, *Gamble* [Lauraceae - Cryptocaryeae]; species distincta *C. amygdalinae*, Nees, et *C. areolatae*, Gamble, affinis, sed notis plurimis differt, pracipue foliorum nervis prominentibus et reticulatione.

Arbor ad 20 m. alta, trunci diametro ad 60 cm., ramulis crassis angulatis fuscis. *Folia* coriacea, elliptica vel elliptico-oblonga, apice parum acuminata, basi rotundata et saepe inaequalia; utrinque glabra; 10–16 cm. longa, 3–6 cm. lata; nervi utrinque 6–9, supra parum impressi, subtus maxime prominuli nervulis transversis numerosis gracilibus et reticulatione minute areolata juncti: petioli curvati, parum puberuli, 10–15 mm. longi. *Paniculae* laterales, pauciflorae, quam folia breviores, fructiferae tantum cognitae. *Flores* ignoti. *Drupa* globosa, glabra, siccitate nigra, 10–12 mm. diametro.

Malay Peninsula. In open mixed forest on Ulu Bubong, 150–250 m., *King's Collector*, 10570.

Cryptocarya argentea, *Gamble* [Lauraceae-Cryptocaryeae]; species *C. Kurzii*, Hook. f., peraffinis, foliis minoribus minus acuminatis differt.

Arbor ad 20 m. alta, trunci diametro ad 50 cm., ramulis gracilibus pallide brunneis lenticellatis, ultimis minute puberulis. *Folia* coriacea, saepe bullata, oblonga vel oblongo-lanceolata, apice breviter obtuse acuminata, basi cuneata; utrinque glabra, supra nitida, infra argenteo-grisea, siccitate caeruleo-glauca; 8–15 cm. longa, 3–6 cm. lata; nervi et costa puberuli costa superne impressa, nervis utrinque

8–10 parum impressis, nervulis transversis irregularibus et reticulatione obscura ; petioli graciles, 9–12 cm. longi. *Paniculae* axillares vel terminales, graciles, ad 6 cm. longae, florentes ignotae. *Fructus* ignotus.

Malay Peninsula. Perak : in dense forest, 90–180 m., *King's Collector*, 7966.

Cryptocarya paucinervia, *Gamble* [Lauraceae - Cryptocaryeae] ; species *C. costatae*, Blume, affinis, fructu globoso nec oblongo, pedicellis crassis nec gracilibus et foliis minus nervosis differt.

Arbor ?, ramuli teretes, nigri, puberuli. *Folia* coriacea, lanceolata vel oblongo-lanceolata, apice obtuse acuminata, basi saepe inaequaliter attenuata ; supra et infra glabra ; 9–13 cm. longa, 3–5 cm. lata ; costa gracilis supra impressa ; nervi laterales utrinque 3–5, obliqui, distantes, supra impressi, nervulis nullis vel perpaucis obscuris sed reticulatione minutissime areolata ; petioli breves, 1 cm. longi, curvati. *Paniculae* axillares, foliis breviores, rhachi angulata. *Fructus* globosus, costatus, siccitate niger, 12–14 mm. diametro ; cotyledones crassi, hemispherici.

Sumatra. Mt. Goening, 200–250 m., *H. O. Forbes*, 2588.

Cryptocarya longepaniculata, *Gamble* [Lauraceae] ; species insignis *C. Griffithianae*, Wight, et *C. crassinerviae*, Miq., affinis, paniculis ramosis patentibus longissimis, floribus distantibus paullo vestitis, et bracteis minimis differt.

Arbor, ramuli crassi, sulcati, fulvo-puberuli. *Folia* coriacea, elliptica vel elliptico-oblonga, apice abrupte acuminata, basi rotundata ; 15–25 cm. longa, 6–11 cm. lata ; supra plus minusve lucentia et nervis exceptis glabra, infra glauca et griseo-pubescentia, intra nervos fusco-tomentosa ; costa crassa, profunde impressa, nervi omnes impressi laterales, utrinque 7–9, marginem versus curvati, nervulis multis parallelis inter se junctis, reticulatione conspicua ; pedicelli crassi, puberuli, 1–2 cm. longi. *Paniculae* terminales vel laterales, pubescentes, ad 30 cm. longae et 20 cm. latae ; pedunculi primarii ad 12 cm. longi, secundarii distantes, ad 6 cm. longi ; cymulae pauciflorae ; flores sessiles, bracteis tribus 1–2 mm. longis muniti. *Perianthii* tubus 3 mm. longus, infundibuliformis ; lobi ovati, subaequales, glandulosi, 2 mm. longi. *Stamina* ordinum I et II 1·5 mm. longa, connectivo supra rotundato, filamento hirsuto ; ordinis III caeteris aequilonga vel paullo longiora, connectivo longe producto ; staminodia ordinis IV cordata, longe acuminata, antice glabra, postice longe villosa, 1·5 mm. longa ; glandulae glabrae stipitatae rotundatae, ·5 mm. longae. *Ovarium* glabrum, oblongum, cum stylo gracili 2 mm. longum ; stigma obtusum. *Fructus* adhuc ignotus.

Borneo. Sarawak ; near Kuching, *Haviland & Hose*, 3295.

Cryptocarya fagifolia, *Gamble* [Lauraceae-Cryptocaryeae] : species foliis chartaceis parvis iis *Fagi sylvaticae* similibus, paniculis multifloris et perianthii tubo distincto supra compresso insignis.

Arbor ?, ramuli graciles, striati, praecipue ad innovationes puberuli. *Folia* chartacea, elliptico-ovata vel lanceolata, apice obtuse caudato-acuminata, basi cuneata, juniora puberula, matura costa et nervis exceptis glabra ; 7–10 cm. longa, 3–4 cm. lata : costa gracilis sicut nervi supra impressa infra distincta, nervi utrinque 5–6

marginem versus curvati et inter se nervulis paucis subparallelis et reticulatione pulchre areolata junctis; petioli breves, 7–10 mm. longi. *Paniculae* axillares et laterales, fulvo-pubescentes, folia longe superantes et aliquando ad 15 cm. longae; rami patentes cymulis multis multifloris; bracteae lineares; bracteolae caducae minutae; flores subsessiles. *Perianthii* tubus cylindricus, superne constrictus, 1 mm. longus; lobi ovato-oblongi, acuti, 1·5-2 mm. longi, intus parce villosi. *Stamina* ordinum I et II rotundata, apiculata, filamentis villosis; ordinis III apice cristata; staminodia ordinis IV cordata, acuminata, dorso villosa; glandulae glabrae rotundatae, pedicellis brevibus villosis. *Ovarium* oblongum, glabrum, in stylum attenuatum, stigmate capitato. *Fructus* ignotus.

New Guinea. *H. O. Forbes*, 218.

Cryptocarya apamaefolia, *Gamble* [Lauraceae-Cryptocaryeae]; species fructu oblongo-conico et foliis infra glaucis, nervulis transversis conspicuis subregularibus insignis.

Arbor ?, ramuli graciles, lenticellati, praecipue ad innovationes puberuli. *Folia* chartacea, oblongo-lanceolata, apice obtuse cuspidato-acuminata, basi saepe inaequaliter cuneata; supra lucida et costa excepta puberula, infra glauca et glabra; 12–18 cm. longa, 5–7 cm. lata; costa gracilis supra impressa, nervi laterales utrinque 5–6, obliqui, marginem versus curvati et cum eo nervulis arcuatis conjuncti, pare infimo gracili prope marginem, nervulis transversis gracilibus subparallelis subregularibus, reticulatione minuta; petioli 1 cm. longi. *Paniculae* laterales, pauciflorae, brevissimae. *Fructus* oblongus, apice conicus, siccitate niger, 20 mm. longus, 6–8 mm. latus (immaturus).

New Guinea. *H. O. Forbes*, 401.

Cryptocarya Forbesii, *Gamble* [Lauraceae-Cyptocaryeae]; ad *C. tomentosam*, Blume, accedit, at floribus majoribus et foliis minus tomentosis subtus haud glaucis differt.

Arbor, ramuli crassi, sulcati, adpresse fulvo-puberuli. *Folia* coriacea, ovata vel ovato-oblonga, apice obtusa vel obtuse acuminata, basi rotundata saepissime inaequalia; siccitate rufa, supra glabra, lucentia, subtus parce fulvo-puberula, ad costam et nervos villosa; 10–15 cm. longa, 5–10 cm. lata; costa crassa supra impressa; nervi laterales 8–12, supra haud impressi, subtus prominentes, patentes, marginem versus curvati et nervis paucis secundariis et nervulis plus minusve parallelis inter se juncti, reticulatione minuta; pedicelli crassi, fulvo-puberuli, 10–15 mm. longi. *Paniculae* laterales, fusco-puberulae, ad 10 cm. longae et 5 cm. latae; pedunculi primarii 2 cm. longi, secundarii 1 cm. longi, cymis multifloris corymbosis; flores pedicellati, bracteis parvis cito deciduis muniti. *Perianthii* tubus 2 mm. longus, cylindricus; lobi oblongi, tubo aequilongi, intus fulvo-villosi. *Stamina* ordinis I et II 1·5 mm. longa, connectivis supra obtuse acutis incurvis, filamentis hirsutis; ordinis III caeteris aequilonga, connectivo breviter cristato; staminodia ordinis IV cordata, obtuse acuta, postice fulvo-villosa, antice glabra, 1 mm. longa; glandulae rotundatae, glabrae, 0·5 mm. longae, villoso-stipitatae. *Ovarium* glabrum, stylo gracili et stigmate obtuso. *Fructus* ignotus.

New Guinea. *H. O. Forbes*, 640.

Cryptocarya macrophylla, *Gamble* [Lauraceae - Cryptocaryeae]; species foliis magnis et fructu costato insignis, speciebus adhuc cognitis haud propinqua.

Arbor ?, ramuli crassi, siccitate nigri, sparse lenticellati. *Folia* chartacea, obovata, apice breviter acuminata, basi attenuata, utrinque glabra, supra pallide virentia, subtus caesia; 25–30 cm longa, 10–12 cm. lata; costa crassa supra paullo immersa, nervi laterales utrinque 9–12, distantes, marginem versus curvati, et nervulis subparallelis vix conspicuis juncti, reticulatione minuta; petioli crassi, 15 mm. longi. *Paniculae* laterales et axillares, foliorum dimidium aequantes; rami angulati, patentes; pedicelli breves, vix 1 mm. longi. *Flores* ignoti. *Fructus* globosus, profunde costatus, costulis circa 15, 1 cm. diametro, glaber, siccitate niger, rugosus.

New Guinea. Near Anda, *Teysmann*, Hort. Bog. 7453.

Beilschmiedia insignis, *Gamble* [Lauraceae-Apollonieae]; species cum sequente foliis percoriaceis magnis, paniculis etiam longis insignis.

Arbor mediocris ad 20 m. alta et 60 cm. trunci diametro, ramulis crassis glabris lenticellatis. *Folia* percoriacea, opposita vel alterna, oblonga vel oblongo-oblanceolata, apice acuta, basi attenuata, glabra, lucida; 20–35 cm. longa, 7–12 cm. lata; costa crassa infra siccitate carinata, nervis utrinque 10–15 supra parum impressis, nervulis transversis angulatis infra cum reticulatione conspicuis; petioli crassi, supra sulcati, 20–25 mm. longi. *Paniculae* axillares, graciles, ad 12 cm. longae, rhachi glabro complanato, ramulis paucifloris, pedicellis gracilibus, 2 mm. longis. *Perianthii* tubus cupularis 1 mm. longus; lobi ovati, obtusi, 1·5 mm. longi. *Stamina* ordinum I et II 1·5 mm. longa, filamentis latis albo-villosis et connectivo rotundato; ordinis III longiora glandulis ad basin 2 latis obtusis stipitatis; staminodia ordinis IV cordata, acuminata, stipitata, quam glandulae paullo longiora. *Ovarium* ovoideum, stylo brevi, stigmate bifido. *Drupa* globosa, aspera, 3–4 cm. diametro, breviter apiculata.

Malay Peninsula. Perak; on low ground, below 30 m. in alt., *King's Collector*, 6615, 8479.

Beilschmiedia Kunstleri, *Gamble* [Lauraceae-Apollonieae]; species insignis magnitudine foliorum ut in praecedente *B. insigne*, Gamble, a quo foliis obovatis perianthii lobis longioribus et staminibus longis differt.

Arbor magna, ad 30 m. alta et 60 cm. trunci diametro, ramulis crassissimis 1–2 cm. diametro, cortice aspero. *Folia* percoriacea, opposita vel alterna, obovata vel obovato-oblonga, apice obtusa vel obtuse acuta, basi longe attenuata, glabra, lucida, prominenter reticulata; 25–35 cm. longa, 9–12 cm. lata; costa supra impressa, nervis utrinque 10–12 supra impressis, nervulis transversis multis cum reticulatione irregularibus; petioli crassissimi, puberuli, 1·5–2·5 cm. longi. *Paniculae* axillares, ramosae, puberulae, ad 20 cm. longae, rhachi angulari complanato; pedicellis gracilibus, 1–2 mm. longis. *Perianthii* tubus brevissimus intus infra stamina villosus; lobi oblongi, obtusi, glandulosi, 4 mm. longi. *Stamina* ordinum I et II gracilia, 2–2·5 mm. longa, filamento villoso, connectivo acuto; ordinis III similia glandulis 2 rotundatis stipitatis prope basim; staminodia ordinis IV cordata, acuminata, stipitata, dorso villosa, 1 mm. longa. *Ovarium* ovoideum, gradatim in stylum gracile

attenuatum, stigmate obtuso. *Drupa* obovoidea, rugosa, glabra, apiculata (immatura tantum).

Malay Peninsula. Perak; on low ground near Larut, *King's Collector*, 6854. Singapore; at Bukit Timah, *Bayliss*, 5885.

Beilschmiedia Curtisii, *Gamble* [Lauraceae-Apollonieae]; species *B. malaccensi*, Hook. f., affinis, sed foliis tomentosis, foliorum nervatione, perianthii tubo obconico et staminodiis brevissime stipitatis differt.

Arbor, ad 20 m. alta, ramulis crassissimis dense fusco-tomentosis. *Folia* coriacea, alterna, elliptica, apice rotundata, acumine brevissimo, basi etiam rotundata vel obtuse acuta, supra lucida et praeter costam et nervos glabra, infra purpureo-fusco-tomentosa, marginibus recurvis; 15–30 cm. longa, 8–13 cm. lata; costa crassa, nervis utrinque 10–12 supra impressis infra prominulis, nervulis transversis irregularibus, cum reticulatione supra prominentibus; petioli crassissimi, fusco-tomentosi, 2–3 cm. longi. *Paniculae* axillares, breves, corymbosae, fusco-tomentosae, ad 2·5 cm. longae, bracteis ovatis caducis, pedicellis gracilibus 1·5–2 mm. longis. *Perianthii* tubus obconicus; lobi ovati vel oblongi, prominenter ferrugineo-villosi, 3–3·5 mm. longi. *Stamina* ordinum I et II 1·5–2 mm. longa, obtusa, filamentis villosis; ordinis III longiora, glandulis 2 brevissimis cordatis prope basin; staminodia ordinis IV 1 mm. longa, brevissime villoso-stipitata. *Ovarium* conoideum, glabrum, stylo gracili, stigmate parvo capitato. *Drupa* oblonga vel obovoidea, nigra, laevis, 2·5 cm. longa, 12–15 mm. lata, pericarpio lignoso, pedicellis ad 3 mm. diametro incrassatis.

Malay Peninsula. Penang; on Government hill, 600 m., *Curtis*, 1015. Singapore; in garden jungle, *Ridley*, 8075.

Beilschmiedia Scortechinii, *Gamble* [Lauraceae - Apollonieae]; species *B. malaccensi*, Hook. f., affinis sed foliis suboppositis et inflorescentia ferrugineo-pubescenti differt.

Arbor, ramulis crassis prominenter lenticellatis ferrugineo-pubescentibus. *Folia* coriacea, subopposita, oblongo-lanceolata, apice acuminata, basi attenuata, supra praeter costam glabra, infra ferrugineo-puberula; 12–20 cm. longa, 3–5 cm. lata; costa crassa, nervis utrinque circa 12, reticulatione irregulari areolata; petioli crassi, ferrugineo-pubescentes, 1·5–2·5 cm. longi. *Paniculae* axillares, ferrugineo-pubescentes, pauci-ramosae, ad 12 cm. longae et 6 cm. latae, ramulis et rhachi complanatis, pedicellis 2 mm. longis, bracteis et bracteolis minimis caducis. *Perianthii* tubus campanulatus, 1·5 mm. longus; lobi oblongi, 2·5 mm. longi, intus fulvo-villosi. *Stamina* ordinum I et II crassa, filamento pubescente, connectivo obtuso vel emarginato; ordinis III caeteris aequilonga sed gracillima, apice emarginata, glandulis 2 cordatis stipitatis; staminodia ordinis IV cordata obtusa, antice concava, postice pubescentia, glandulis subaequalia. *Ovarium* puberulum, stylo gracili, stigmate obtuso. *Fructus* ignotus.

Malay Peninsula. Perak; at Caulfield's Hill, 1220 m., *Scortechini*, 483, 493.

Beilschmiedia lumutensis, *Gamble* [Lauraceae-Apollonieae]; species distincta, foliis oppositis glabris, paniculis gracilibus paucifloris et floribus minimis insignis.

Arbor (?), ramulis gracilibus glabris purpurascentibus. *Folia* opposita, coriacea, reticulata, elliptica vel elliptico-oblonga, apice acuta, basi attenuata, glabra, nitida ; 10–14 cm. longa, 4–6 cm. lata ; costa gracilis, nervis utrinque 8–10, reticulatione prominenter areolata ; petioli 7–12 cm. longi, purpurei. *Paniculae* axillares, glabrae, 4–6 cm. longae, ramis elongatis gracilibus, pedunculo crasso 2–3 mm. longo, floribus minutis subglabris. *Perianthii* tubus campanulatus praeter annulum villosum intus glaber, glandulosus ; lobi breves, ovati vel orbiculares, glabri, cum tubo 1·5 mm. longi. *Stamina* ordinum I et II ad 1 mm. longa, connectivo acuto ; ordinis III similia, glandulis 2 ad basin magnis ; staminodia ordinis IV cordata, stipitata, glabra vel filamentis parce villosis. *Ovarium* ovoideum, glabrum, stylo brevi, stigmate obtuso.

Malay Peninsula. Perak ; at Lumut Dinding, *Ridley*, 10323.

Beilschmiedia perakensis, *Gamble* [Lauraceae-Apollonieae] ; species *B. longipedi*, Hook. f., affinis, foliorum forma et textura, nervis irregularibus et paniculis rufescentibus differt.

Arbor parva vel arbuscula ad 12 m. alta et 25 cm. trunci diametro, ramulis gracilibus fuscis parum pubescentibus. *Folia* alterna, chartacea, juniora membranacea, elliptica vel elliptico-obovata, apice brevissime acuminata, basi cuneata vel attenuata, supra praeter costam et nervos glabra, infra minute puberula ; 8–15 cm. longa, 4–7 cm. lata ; costa non nimis crassa, nervis utrinque 10–12, irregularibus, nervulis transversis prominentibus et reticulatione conspicua inter se junctis ; petioli crassi, pubescentes, 5–10 mm. longi. *Paniculae* axillares, graciles, ferrugineo-pubescentes, ad 10–14 cm. longae, pedunculo longo, ramulis paucis ; bracteis et bracteolis linearibus, pedicellis gracilibus. *Perianthii* tubus brevissimus ; lobi ovati, obtusi vel parum acuti, 1·5 mm. longi. *Staminu* ordinum I et II gracilia, 1 mm. longa, connectivo rotundato, filamento puberulo ; ordinis III longiora, glandulis 2 ad basin ovoideis stipitatis ; staminodia ordinis IV ovata, acuta, brevia. *Ovarium* oblongum, stylo brevi, stigmate obtuso. *Drupa* oblonga vel obovoidea, nigra, 12–15 mm. longa, 7–8 mm. lata, pericarpio crasso ; pedicellis vix incrassatis. *Semina* cotyledonibus crassis.

Malay Peninsula. Perak, *Scortechini* ; on hills, 150–250 m., *King's Collector*, 8489, 10026, 10432.

Beilschmiedia penangiana, *Gamble* [Lauraceae-Apollonieae] ; species floribus racemosis bracteatis, foliis membranaceis rufescentibus et ramulis albis distincta.

Arbor ad 10–12 m. alta, ramulis albis lucidis, lenticellis oblongis. *Folia* membranacea, alterna vel subopposita, glabra, elliptica vel elliptico-lanceolata, apice obtusissime acuminata, basi acuminata ; 7–10 cm. longa, 3–4 cm. lata ; costa lata, supra impressa, nervis utrinque 10–12 irregularibus supra et infra prominentibus, nervulis transversis etiam prominentibus, reticulatione obscura ; petioli lati, 5–10 mm. longi. *Racemi* axillares, breves, bracteis sub floribus orbicularibus fimbriatis bracteolis 2 lanceolatis amplectentibus, pedicellis crassis. *Perianthii* tubus brevis ; lobi ovati, ciliati, 1 mm. longi, subaequales. *Stamina* ordinum I et II 1 mm. longa, glabra, filamentis crassis ; ordinis III similia, glandulis 2 ad basin suborbi-

cularibus stipitatis ; staminodia ordinis IV cordata, brevissime stipitata, 5 mm. longa. *Ovarium* globosum, glabrum, stylo brevi, stigmate obtuso. *Fructus* ignotus.

Malay Peninsula. Penang ; at Penara Bukit, 300 m., *Curtis*, 1098.

Beilschmiedia membranacea, *Gamble* [Lauraceae-Apollonieae] ; species *B. perakensi*, Gamble, affinis, foliis membranaceis ellipticis et drupa oblonga.

Arbor parva, ad 6 m. alta et 15 cm. trunci diametro, ramulis gracilibus griseis molliter nigro-puberulis, innovationibus ferrugineo-tomentosis. *Folia* membranacea, alterna, elliptica vel elliptico-ovata, apice obtuse acuminata, basi attenuata vel inaequaliter rotundata, praeter costam et nervos glabra ; 10–15 cm. longa, 5–8 cm. lata ; costa gracilis, nervis utrinque 9–11 reticulatione irregulari supra et infra prominulo junctis ; petioli crassi, 5–10 mm. longi. *Flores* ignoti, ut videtur in cymis brevibus axillaribus. *Drupa* oblonga, laevis, ad 15 mm. longa, 7 mm. diametro, pedicellis vix incrassatis.

Malay Peninsula. Perak ; in open forest, 600–900 m., *King's Collector*, 10928.

Beilschmiedia pahangensis, *Gamble* [Lauraceae - Apollonieae] ; species distincta, foliis lanceolatis chartaceis et drupa ellipsoidea insignis.

Arbor, ramulis gracilibus griseo-fuscis glabris. *Folia* chartacea, alterna, lanceolata vel oblongo-lanceolata, apice obtuse acuta, basi longe attenuata vel cuneata, glabra, prominenter reticulata, supra lucida ; 10–15 cm. longa, 3–5 cm. lata ; costa gracilis, nervis utrinque 10–12 irregularibus prope marginem anastomosantibus nervulis et reticulatione irregulari prominentibus ; petioli graciles, 1–2 cm. longi, rugosi. *Paniculae* axillares, ad 6 cm. longae ; flores ignoti. *Drupa* ellipsoidea, obtusa, nigrescens tuberculis pallidis, 2–2·5 cm. longa, 1 cm. lata. *Semina* cotyledonibus carnosis.

Malay Peninsula. Pahang ; at Kwala Triang and Suboo Lanjoot, *Ridley*, 2273.

Beilschmiedia Foxiana, *Gamble* [Lauraceae-Apollonieae] ; species foliis coriaceis lanceolatis et drupa longa insignis.

Arbor ?, ramulis crassis laevibus lenticellatis. *Folia* coriacea, subopposita, prominenter reticulata, lanceolata vel oblanceolata, apice obtuse acuminata, basi longe cuneata, glabra, margine parum recurva ; 12–16 cm. longa, 5–7 cm. lata ; costa crassa, nervis utrinque 7 obliquis, prope marginem seriatim arcuatis, nervulis transversis irregularibus et reticulatione areolata prominente junctis ; petioli crassi, 2–2·5 cm. longi. *Paniculae* ramosae, ad 20 cm. longae, glabrae, pedunculis et ramis lenticellis oblongis notatis ; flores ignoti. *Drupa* ellipsoidea, pustulata, 3·5 cm. longa, 2–2·5 cm. lata, pedicellis incrassatis ferrugineo-fuscis rugosis.

Malay Peninsula. Penang ; at Birch's Hill, *Fox*, 10705 (Herb. Singap.).

Dehaasia nigrescens, *Gamble* [Lauraceae-Apollonieae] ; species *D. cuneatae*, Blume, affinis, sed foliis chartaceis lanceolatis minus reticulatis haud ad apices ramulorum fasciculatis.

Arbor, ad 10–12 m. alta, ramulis gracilibus griseo-albis ultimis siccitate nigris. *Folia* chartacea, lanceolata vel oblanceolata, apice obtuse longe acuminata, basi attenuata, glabra, siccitate nigrescentia ; 8–13 cm. longa, 3–4 cm. lata ; costa gracilis, nervis utrinque 8–10 curvatis et prope marginem inter se arcuatis : petioli graciles, 1–2 cm. longi. *Paniculae* ex foliorum axillis ultimorum, graciles, glabrae, ad 10 cm. longae, pedunculo longo, ramis dichotomis, pedicellis clavatis, floribus minimis. *Perianthii* tubus cupularis cum pedicello continuus ; lobi parvi, 3 exteriores triangulares, 0·75 mm. longi, 3 interiores duplo longiores ovati, omnes subtus aureo-pubescentes, intus villosi. *Stamina* ordinum I et II clavata, 0·75 mm. longa, connectivis obtusis, filamentis villosis ; ordinis III paullo longiora, glandulis 2 magnis cordatis glabris ; staminodia ordinis IV 0·5 mm. longa, cordata, quam glandulae minora. *Ovarium* globosum, stylo brevi, stigmate obtuso. *Drupa* nigra, obovato-ellipsoidea, 2 cm. longa, 1 cm. diametro ; pedicello incrassato obconico recto vel curvato purpureo (siccitate nigro) insidens, perianthii lobis persistentibus.

Malay Peninsula. Penang ; on Government Hill, 300–600 m., *Curtis*, 1183. Singapore ; in garden jungle, *Ridley*, 13017.

Dehaasia Curtisii, *Gamble* [Lauraceae-Apollonieae] ; species *D. cuneatae*, Blume, affinis, paniculis glabris staminodiis minoribus et foliorum nervis vix impressis distincta.

Arbor parva, ramulis crassis asperis griseo-albis. *Folia* coriacea, ad apices ramulorum fasciculata, glabra, minute areolato-reticulata, supra lucida, infra glauca, marginibus recurvis ; 6–12 cm. longa, 3–5 cm. lata ; nervis utrinque 10–12 curvatis et prope marginem inter se arcuatis, reticulatione prominenter areolata ; petioli 1–2 cm. longi, nigri, canaliculati. *Paniculae* ex foliorum ultimorum axillis graciles, dichotomae, corymbosae, glabrae, 6 cm. longae, pedunculis 4–5 cm. longis parum complanatis, ramulis gracilibus, cymulis 3-floris, pedicellis clavatis cum tubo perianthii continuis, floribus minutis. *Perianthii* tubus cupularis ; lobi ovati, obtusi, 3 exteriores 1–1·5 mm. longi, 3 interiores 1·5–2 mm. longi, omnes parum pubescentes. *Stamina* minima, ordinum I et II 0·75 mm. longa, clavata, villosa, connectivo emarginato; ordinis III paullo longiora, obtusa, glandulis 2 magnis glabris prope basin ; staminodia ordinis IV minima, cordata, stipitata, postice villosa. *Ovarium* ovoideum, stylo gracili, stigmate obtuso. *Drupa* ellipsoidea, siccitate nigra, laevis, 1 cm. longa, 0·75 cm. diametro, pedicello incrassato clavato 5 mm. longo insidens.

Malay Peninsula. Penang : Government Hill : at the Rifle Range, 750 m., *Curtis*, 1193. Selangor ; top of Batu caves, *Kelsall*, 1986 ; *Ridley* (forma foliis et drupa minoribus).

Endiandra Kingiana, *Gamble* [Lauraceae-Acrodiclidieae] ; species *E. Maingayi*, Hook. f., affinis sed foliis majoribus infra pubescentibus latis et nervis paucioribus, etiam paniculis dense fulvo-pubescentibus differt.

Arbor 15–20 m. alta, ramis patulis, ramulis crassis lenticellatis ultimis glandulose ferrugineo-pubescentibus. *Folia* coriacea, elliptica, apice obtuse brevi-acuminata, basi acuta vel cuneata, supra lucida, minute areolata, glabra, infra etiam areolata, molliter

pubescentia; 10–13 cm. longa, 6–7 cm. lata; nervis utrinque 5–6 supra impressis pubescentibus, marginem versus curvatis et ibi arcuatim junctis, secundariis paucis, reticulatione areolata; petioli crassi, fulvo-pubescentes, rugosi, 1·5–2 cm. longi. *Paniculae* breves, axillares vel terminales, fulvo-pubescentes, cymulis paucifloris, pedicellis nullis vel brevissimis, bracteis parvis caducis; floribus lutescentibus. *Perianthii* tubus brevissimus, ferrugineo-pubescens; lobi ad 3 mm. longi, ovato-oblongi, 3 exteriores longiores, omnes intus ad basin granuloso-glandulosi. *Stamina* ordinum I et II nulla; ordinis III 3, crassa, conoidea, 1·5–2 mm. longa, supra ovarium conniventia, antheris sessilibus, thecis 2. elongatis; staminodia nulla. *Ovarium* globosum, glabrum, 0·5 mm. diametro; stylo crasso, stigmate capitato. *Drupa* non visa.

Malay Peninsula. Perak; in dense jungle, 150–250 m., *King's Collector*, 6487 (descriptio praecipue ex Kingii notulis).

Endiandra praeclara, *Gamble* [Lauraceae-Acrodiclidieae]; species insignis, ab *E. Maingayi*, Hook. f., et *E. Kingiana*, Gamble, foliis magnis glabris, paniculis elongatis, floribus majoribus et drupa maxima distincta.

Arbor ad 15–20 m. alta et 45–60 cm. diametro, ramis patulis, ramulis laevibus glabris striatis. *Folia* chartaceo-coriacea, elliptico-obovata vel oblonga, apice breviter obtuse acuta vel acuminata, basi cuneata vel interdum rotundata, glabra, conspicue areolato-reticulata; 15–40 cm. longa, 5–17 cm. lata; costa crassa supra depressa, nervis utrinque 8–10 irregularibus, pare infimo submarginali, reliquis primo rectis deinde curvatis et prope marginem arcuatim junctis, nervulis transversis haud prominulis sed reticulatione areolata junctis; petioli crassi, rugosi, 10–15 cm. longi. *Paniculae* axillares vel subterminales, ramosae, ad 20 cm. longae et 10 cm. latae, subglabrae, pedunculis nullis vel brevibus, rhachi complanata; cymulis puberulis paucifloris, pedicellis gracilibus 1–2 mm. longis, floribus luteis. *Perianthii* tubus cupularis, puberulus; lobi ovati, 3 exteriores 2·5 mm. longi, 3 interioribus paullo longiores; omnes extus glabri, intus basin versus granulato-glandulosi. *Stamina* ordinum I et II nulla, ordinis III crassa, conoidea, supra ovarium conniventia, 2 mm. longa, connectivo granuloso-glanduloso, antheris sessilibus, thecis distantibus oblongis; staminodia ordinis IV nulla. *Ovarium* globosum, stylo brevi, stigmate capitato. *Drupa* oblongo-ellipsoidea, purpurea, laevis, 8–10 cm. longa, 4 cm. diametro, pericarpio tenuiori, cotyledonibus magnis carnosis.

Malay Peninsula. Perak; at Tupai, *Wray*, 3097; near Larut up to 300 m., *King's Collector*, 4074, 6714.

Endiandra Wrayi, *Gamble* [Lauraceae-Acrodiclidieae]; species haud bene nota; foliis glabris plus minusve lanceolatis coriaceis, nervis utrinque 5–7, drupa oblonga 2·5 cm. longa 1 cm. lata distincta.

Arbor parva, ramulis gracilibus lenticellatis, ultimis angulatis, rugosis. *Folia* coriacea, elliptico-oblonga vel oblanceolata, apice obtusissime acuminata, basi cuneata, glabra, areolato-reticulata, lucida, 7–14 cm. longa, 2–5 cm. lata, costa gracilis utrinque prominens, nervis utrinque 5–7 supra parum impressis obliquis primo rectis deinde curvatis et prope marginem arcuato-junctis,

reticulatione areolata; petioli graciles, 5–10 mm. longi. *Flores* ignoti, in racemos vel paniculas axillares dispositi. *Drupa* oblonga, nigra, laevis, 2·5 cm. longa, 1 cm. diametro, pedunculo paullo incrassato.

Malay Peninsula. Upper Perak, 300 m., *Wray*, 3785.

Endiandra Forbesii, *Gamble* [Lauraceae-Acrodiclidieae]; species *E. hypotephrae*, F. Muell., accedit, sed foliis majoribus minus pubescentibus et inflorescentia longiore differt.

Arbor, ramuli crassi, rugosi, minute puberuli. *Folia* coriacea, elliptico-oblonga vel lanceolata, apice longe cuspidato-acuminata, basi attenuata, supra glabra, infra minutissime puberula tandem glauca; 18–23 cm. longa, 6–9 cm. lata; costa crassa supra profunde impressa, infra prominens, nervis lateralibus utrinque 12–14 parallelis supra insigniter impressis, infra prominentibus, marginem versus leviter curvatis; reticulatione supra et infra insigniter et minutissime areolata; petiolus crassus, 15–20 mm. longus. *Paniculae* axillares, foliis longiores, fulvo-tomentosae, a medio ramosae, sparsiflorae; rami pauci 2–3 cm. longi, cymulas paucifloras ferentes; bracteae ovatae; pedicelli graciles; flores 3–4 mm. diametro. *Perianthii* tubus brevis; lobi 6, subaequales, ovati. *Stamina* ordinum I et II in annulum crassum rotundatum margine serratum mutata; ordinis III 3, paullo exserta, 2-locularia, extrorsa, ovarium obtegentia, clavata, apice rotundata, 1·25 mm. longa; staminodia ordinis IV nulla. *Ovarium* glabrum, in stylum brevem productum, stigmate obtuso. *Fructus* non visus.

New Guinea. *H. O. Forbes*, 543.

XXII.—A HISTORY OF THE GARDENS OF THE MALAY PENINSULA.

The following account of the Gardens of the Malay Peninsula has been extracted from an article entitled "The Abolition of the Botanic Gardens of Penang," by the Editor of the Agricultural Bulletin of the Straits and Federated Malay States, published in that journal for March, 1910, pp. 100–105.

"As has been mentioned in the first part of this article the Gardens doomed to disappear are the third gardens made and destroyed in Penang since its founding, and though reference has been made in a previous paper to the history of the Gardens of the Peninsula it will be interesting no doubt to many to read the story of the previous Gardens as fully as I have been at present able to trace their history. The first settlement at Penang was made in 1786, by Captain Light, and shortly after this the Honourable East India Company decided to start spice-gardens with a view of breaking down the Dutch monopoly of the spice cultivation and trade. So in 1794 Christopher Smith was appointed their Botanist, and in 1796 was sent to the Moluccas to collect living plants of nutmegs and cloves with which to start the cultivation. In 1798

five park-slaves from the Banda nutmeg parks, as they were called, arrived in Penang, sent by the Resident of Banda to look after the nutmegs and cloves, of which about 600 nutmeg plants and half a dozen clove trees had been already received in Penang. In May, 1800, there were 1,300 plants in the Gardens, which consisted of 20 orlongs at Ayer Hitam and 300 orlongs reserved at Sungei Cloan, chiefly for growing pepper. In June 29, the ship Amboyna arrived from Amboyna with 15,000 cloves and 500 nutmeg trees. The Botanic Gardens were now much enlarged, and it was urged that Mr. Smith should return and take charge of them as soon as possible. In 1802 there were 19,000 nutmeg trees and 6,250 cloves in the Gardens and altogether about 33,000 spice plants in the island.

"The first nutmeg fruit and the first mangosteen in Penang were produced in 1801. At this time Sir William Hunter, surgeon to the East India Company, was in charge of the Gardens, with a staff of fifty convicts. An account of the plants of Prince of Wales Island from a manuscript in the British Museum, was published recently by the Editor in the Journal of the Straits Branch of the Royal Asiatic Society, vol. 53. It shows that a number of other plants of a useful and ornamental character, many obviously sent from the Moluccas by Smith, were cultivated in the spice gardens. Among the plants recorded in this work and elsewhere are Cinnamon, Pimento Coffee, Kaya Puteh, Colelava (*sic*, probably clove bark, Kulit Lawan, *Cinnamomum Culilawan*, Bl.), Teak, Loquat, *Artabotrys odoratissima*, Canary nut, etc.

"Christopher Smith returned from the Moluccas and was appointed Superintendent of the Botanic Gardens in 1806, having sent to Penang 71,266 nutmeg plants, 55,264 cloves and large quantities of *Canarium commune*, the Canary nut, and *Arenga saccharifera*, the well known Kabong Palm.

"Capt. James Law, in his dissertation on the soil and agriculture of Penang (1836), describes the position and area of the Gardens thus :—'It comprised 130 acres of land lying on the slopes which skirt the base of the hill near Amie's mills, a romantic spot and well watered by a running stream called Ayer Puteh. It contained 19,628 nutmegs from one to four years old, 3,460 being four years old, and 6,259 clove trees, of which 669 were above six and under seven years old.' Hunter says the Gardens were in the valley of Ayer Hitam.

"Sir George Leith was Lieut. Governor but was succeeded by Col. R. T. Farquhar in 1803. He appears to have been a reckless and extravagant man, spending large sums on his own luxury and on useless fortifications.

"Hunter seems to have left the island about 1803, and Smith died in 1806, or soon after.

"The Gardens, which in 1804 to 1805 had a staff of 80 coolies and cost $11,909,41, were sold at 12 days' notice by auction for $9,656. The trees were dug up and carried off by the purchasers but most of them died. So ended the first Gardens of Penang.

"From 1805 to 1822 Penang possessed no gardens, then at the instance of Sir Stamford Raffles the second gardens were founded. They were also situated at Ayer Hitam, and put under the charge of a botanical school master, George Porter. These gardens existed

till 1834, when Governor Murchison who took no interest in gardens or agriculture sold them for 1,250 rupees because his wife could not get enough vegetables from them to diminish the cost of her cook's bills, and so ended the second Penang Gardens.

"There were no other gardens in Penang till 1884, nor do we hear of any attempts on the part of the Government to improve cultivation or develop agriculture in the meantime.

"On the founding of Singapore, Sir Stamford Raffles introduced nutmegs, cloves, and cocoa, and founded the first Botanic Gardens there in 1822. He writes to Marsden, January 31, 1823. 'I am laying out a Botanic and Experimental Garden' and to Dr.Wallich, February 8 : 'The Botanic Garden goes on well. I am now employed in laying out the walks and stones are collected to make a handsome hand railway round it' (Memoirs, by his Widow, pp. 535, 537). A superintendent of the name of Dunn was employed to look after it, as early as 1819. Dr. Wallich though no doubt much interested in the garden was not, as Buckley in his anecdotal history of Singapore says, superintendent. He had come down from Calcutta for his health in 1822 and returned in 1823. The gardens were on the North East of the Government house (Fort Canning) and were 48 acres in extent and a bungalow for the Superintendent was built in them. Sir Stamford Raffles left the East in 1823 ; a monthly vote of 60 dollars was allowed for the upkeep.

"In 1829 the establishment was discontinued and 10 convicts were put on to keep the ground in order. Lord George Bentinck had come as Governor-General. In 1827 Dr. Montgomerie who took much interest in agriculture and horticulture was superintending the gardens, and cultivating spices and endeavouring to induce planters to take them up as there was a good demand for them and Penang could not supply sufficient.

"Lord George Bentinck had been sent to retrench the expenditure of the colony and soon sold off the gardens, and that was the end of the first Singapore Gardens. By this time agriculture in Singapore was beginning to develop rapidly and Jose D' Almeida, T. C. Crane, Dr. Montgomerie and Dr. Oxley were doing their best to aid in its development.

"The Government however did not encourage these efforts. There were no gardens nor was there any botanist or agriculturist employed by them and the land-laws were so bad that in 1836 Dr. Montgomerie and others formed an Agri-Horticultural society to petition the Government to encourage agriculture. This does not seem to have been of much use as the same complaints were made in 1843. Though a great deal of good work was done by the amateurs, Montgomerie, Crane, Oxley, Almeida, Whampo and others, the utter absence of any professional agriculturist who could employ his whole time in the study of agriculture prevented its becoming a really important feature in the progress of the country. Practically no new plants were introduced, no investigations into pests, no improved methods of cultivation tried during this period.

"The same year that the Singapore Agri-Horticultural Society was founded a similar one was formed in Penang, but probably died in the same year, viz., in 1846. Three years after, Dr. Montgomerie, the leading spirit, left Singapore. Another Horticultural Society

was founded in Singapore in 1859 or 1860. It got hopelessly into debt in 1873, and the Government eventually took over its property in 1878, and thus was founded the second Botanic Gardens of Singapore.

"The apathy of the Government from 1829 to 1860 naturally ended in disaster, which took the form of a ruinous collapse of the most important industry in Penang and Singapore, viz., the nutmeg cultivation. The trees died wholesale in a single night apparently from the attacks of a beetle. Cullingwood thus describes the catastrophe. 'The planters abandoned the plantations in disgust in many cases where there were still numerous healthy trees and the land reverted to Government. In other cases, where expensive bungalows had been built upon the estate, they were sold for a small proportion of the sums expended in building them since they were as a rule too far from town to command any competition and ceased to be conveniently situated. Many planters, both English and Chinese, whose whole estates were invested in nutmeg plantations were thus reduced to ruin and absolutely penniless and distress and disappointment everywhere prevaled.' Had the Penang Garden, abolished by Bentinck, been maintained and suitable superintendents employed to watch the interests of the planters, this catastrophe would probably have never occurred or at worst would have been much mitigated.

"But to return to the Gardens. The Singapore Gardens really commenced in 1875 when H. J. Murton was appointed to take charge of the agri-horticultural gardens now under Government though not formally so till 1878. He was succeeded by N. Cantley, in 1880, who established the third Penang Gardens in 1884, and the Malacca Gardens at Bukit Sabukor in 1886. These Gardens, over which Mr. Derry had control, were very useful in experimental work and in supplying economic plants to the Malacca planters. They were abolished by Sir Charles Mitchell, in 1896, and as a large portion of the ground had been presented to the Government by a Chinaman on condition that they should serve as a Botanic Garden for Malacca and revert to him when no longer so used, the ground on the abolition of the gardens was returned to the former owner.

"In Perak, Sir Hugh Low took a great interest in agriculture at a time when there was practically no agriculture worthy of the name in the Peninsula, and he founded several gardens or experimental stations for the introduction and cultivation of economic plants. I have found very few records of this work but it appears that most of them were instituted in about 1875 or 1876. They comprised the Gardens of Kuala Kangsar, the Tea Gardens and Maxwell's Hill Gardens, on the Taiping Hills the Hermitage Hill Garden and Waterloo Garden, and Telok Anson.

"After Sir Hugh Low retired from the Peninsula these were all abandoned or sold or remained as gardens attached to various bungalows or Government residences. In any cases, they lost the status intended and established by him.

"In 1903 an economic garden was started at Batu Tiga near Kuala Lumpur, and Mr. Stanley Arden was put in charge. It contained only economic plants and was liberally supplied free with these from the Singapore Botanic Gardens and it contained eventually a very complete series of plants likely to prove useful to planters.

"Mr. Arden left about 1906, and the garden seems to have been practically abandoned shortly afterwards, but we understand that the camphor bushes and rubber trees are still being protected.

"The Federated Malay States Agricultural Department commenced to open out a considerable area of ground for planting rubber and camphor trees, near Kuala Lumpur, in 1906, and this work appears to be progressing.

"Thus we have the history of the Botanic Gardens of the Malay Peninsula as follows :—

	(Founded)	(Abolished)
First Penang Garden	1800	1805
Second Penang Garden	1822	1826
First Singapore Garden	1823	1829
Second Singapore Garden	1878	still existing
Third Penang Garden	1884	1910
Malacca Garden	1886	1894
Kuala Kangsar Garden	1876	before 1888
Maxwell's Hill, Tea Gardens	1882	,,
Hermitage Hill	before 1880	1893
Waterloo Hill	,, ,,	before 1888
Durian Sabatang or Telok Anson	,, ,,	,,
First Select Garden	1903	1906
Kuala Lumpur Experiment Plots	1906	existing

"This does not include such smaller nurseries as the hill experimental garden at Penang, the Kubang Ulu Nursery, the Damansara road nursery, Kuala Lumpur, also mostly abandoned, nor the various bungalow gardens and parks kept up by the Government such as the Lake Club Gardens, at Kuala Lumpur, the Taiping Gardens, Reservoir Gardens, etc., which cannot be classed as Botanic Gardens in any sense of the word.

"I have no clue as to the exact dates of any of these gardens. Possibly some of our readers may be able to give more of their history.

"The table above shows that no less than 14 Botanic Gardens and stations have been founded in the Malay Peninsula in little more than a century and of these 11 have been abolished, after a life of from four to fourteen years.

"The Gardens which have existed longest are the Botanic Gardens of Singapore, 32 years, and the next oldest are the Penang Gardens now abolished. The remainder from about four to eight years.

"This is certainly unique in the history of the Gardens of the Empire and indeed of the foreign nations, too, and represents a great amount of hard work by energetic men, and a great deal of money thrown away.

"To compare this with other gardens; that of Peradeniya, Ceylon, was founded in 1821 and has gone on without a break ever since, that is for 89 years. That of Buitenzorg was founded in 1819 and has run continuously. The Botanic Gardens at Calcutta were founded in 1787, Trinidad about 1827, Sydney 1788. These Gardens have all run continuously on the same ground ever since they were founded. There has been none of the making and abolishing after a few years in the manner which seems to have characterised the

Straits Settlements. It may be taken that it requires at least 20 years with a suitable staff and sufficient funds to make a practical and well-stocked Botanic Garden and the longer it lasts and the more continuous its existence in a well found condition, the greater its value. The uncertainty of continuity naturally prevents the Botanist in charge from carrying out satisfactorily researches on slow-growing trees or any of that most important series of investigations which require many years of continuous experiment and observation for their solution, but this must be obvious to every thinking person.

"The story, which is as historically accurate as the author has been able to make it, will, he thinks, be read with astonishment and interest by many agriculturists and botanists. It is a history of enthusiasm, energy and hard work of men who devoted themselves heart and soul to the progress of agriculture and built up Gardens for this purpose which were destroyed ruthlessly after the enthusiast was gone, with the inevitable result of delay of progress, failure of agriculture and catastrophe."

XXIII.—NEW ORCHIDS: DECADE 35.

341. **Bulbophyllum nigrescens**, *Rolfe*; a *B. secundo*, Hook, f., floribus duplo majoribus differt.

Rhizoma repens. *Pseudobulbi* depresso-ovoidei, circa 1·5 cm. longi, 1·5–1·8 cm. lati, monophylli. *Folia* breviter petiolata, oblonga vel lineari-oblonga, subobtusa, subcoriacea, 5–11 cm. longa, 1·2–1·5 cm. lata. *Scapi* graciles, pallidi, basi vaginis paucis obtecti; racemi 8–10 cm. longi, multiflori. *Bracteae* oblongo-lanceolatae, acutae, 2 mm. longae. *Pedicelli* 5–7 mm. longi. *Flores* penduli. *Sepala* subpatentia, elliptico-oblonga, obtusa, 6–8 mm. longa, intus hirsutula; lateralia postico paullo latiora. *Petala* spathulata, hirsuta, 2 mm. longa. *Labellum* carnosum, elliptico-oblongum, obtusum, ciliatum, 6–7 mm. longum, basi canaliculatum. *Columna* vix 2 mm. longa: dentes oblongi, obtusi, breves.

Siam. Near Chiengmai, *A. Kerr*, 84.

Sent for determination from the Botanic Garden, Trinity College, Dublin, by Dr. H. H. Dixon, in May, 1909. The sepals are lined and more or less dotted with blackish purple on a light yellow ground, and the petals and lip blackish-purple, the latter with a green area at the base. Two forms sent differ somewhat in detail, but they appear to be forms of a single species, for which they were collected.

342. **Megaclinium lutescens**, *Rolfe*; a *M. minuto*, Rolfe, rhachi duplo angustiore, sepalo postico acuminato facile distinguendum.

Rhizoma repens, subgracile. *Pseudobulbi* subdistantes, ovoideo-oblongi, tetragoni, circiter 1·5 cm. longi, diphylli. *Folia* sessilia, anguste oblonga, obtusa, subcoriacea, 2–3·5 cm. longa, 5–7 mm. lata. *Scapi* subpatentes, 3–4 cm. longi; rhachis angustissima, scaberula, 2–3 cm. longa, marginibus obtusis. *Bracteae* reflexae, triangulari-oblongae, acutae, 2 mm. longae. *Pedicelli* 2 mm. longi. *Sepala* extus scaberula; sepalum posticum elliptico-oblongum, acutum, concavum, circiter 5 mm. longum; sepala lateralia oblique ovato-

triangularia, acuminata, 3 mm. longa. *Petala* lineari-oblonga, falcata, acuminata, 3 mm. longa. *Labellum* recurvum, 1–5 mm. longum, basi late ovatum, apice oblongum, obtusum. *Columna* late oblonga, 1·5 mm. longa, dentibus oblongis obtusis brevibus.

Tropical Africa. Gold Coast, *Band.*

Flowered at Kew in November, 1909. Flowers honey-yellow.

343. **Phaius Cooperi,** *Rolfe*; a *P. calloso*, Blume, floribus majoribus, labelli calcare attenuato et duplo longiore differt.

Pseudobulbi ovoideo-oblongi, circiter 5 cm. longi, apice 4–5-phylli. *Folia* elongato-lanceolata, acuminata, plicata, basi attenuata et circa caulem convoluta, 40–70 cm. longa, 6–9 cm. lata. *Scapi* erecti, validi, 40–50 cm. alti, multiflori. *Bracteae* elliptico-lanceolatae, subacutae, concavae, circiter 4 cm. longae, deciduae. *Pedicelli* validi, circiter 3 cm. longi. *Flores* magni, speciosi. *Sepala* oblonga, apiculata, carinata, marginibus revolutis, 5 cm. longa, demum decidua, lateralia patentia. *Petala* subspathulato-oblonga, apiculata, marginibus revolutis, sepalis paullo brevioribus et angustioribus. *Labellum* infundibuliforme, circiter 4 cm. longum, columnae marginibus fere ad medium adnatum; limbus trilobus, undulatus; lobi laterales rotundati; lobus intermedius subrecurvus, quadratus, emarginatus; discus obtuse bicallosus; calcar lineare, strictum, 2–2·5 cm. longum. *Columna* clavata, 3 cm. longa, apice anguste alata.

Habitat unknown.

A striking species. All that is known of the history of this plant is that it flowered in the collection of Mr. A. J. Hollington, Forty Hill, Enfield, where it had been cultivated as *Calanthe veratrifolia*, under which name it was obtained. It was purchased by Messrs. Sander & Sons, who exhibited it at the Royal Horticultural Society's meeting held on January 11th, 1910, when it received a Botanical Certificate. Its history and affinity suggest a Malayan habitat. The sepals and petals are bright red-brown in front, and pale yellow behind, and the lip is white at first, soon changing to light-yellow. There are a few reddish markings in the throat, and a pair of lateral red-brown blotches near the apex of the tube outside. It is named by request after Mr. E. Cooper, one of Messrs. Sander's foremen.

344. **Lissochilus Andersoni,** *Rolfe*; a *L. Millsoni*, Rolfe, sepalis latioribus et labello breviore differt.

Rhizoma crassum. *Folia* non vidi. *Scapi* erecti, circiter 50 cm. alti, basi vaginis paucis lanceolatis obtecti; racemi laxi, 4–8-flori. *Bracteae* deltoideo-lanceolatae, acuminatae, 1–1·4 cm. longae. *Pedicelli* 1·5–2 cm. longi. *Flores* 2–2·3 cm. longi, pallide sulfurei. *Sepala* subpatentia, lineari-lanceolata, acuta, 2–2·5 cm. longa; lateralia apice subfalcata. *Petala* erecta, parallela, elliptico-oblonga, subobtusa, 2 cm. longa, 1 cm. lata. *Labellum* 3-lobum, 2·5 cm. longum; lobi laterales late oblongi, obtusi vel truncati, erecti, 1·2 cm. longi; lobus intermedius suborbicularis, obtusus, margine undulato et lateribus recurvis; discus carinis 5–7 verrucosis pallide purpureis instructus; saccus conicus, obtusus, 4–5 cm. longus. *Columna* clavata, subcompressa, 1·2 cm. longa; anthera apiculata.

Tropical Africa. Gold Coast: Afram Plains, *W. H. Johnson*, 851; Aburi, *Anderson.*

Flowered at Kew in April, 1910, the plant having been sent from Aburi by Mr. J. Anderson. The sepals and petals are very pale greenish or sulphur yellow, and the lip white with 5 to 7 verrucose light purple keels on the disc.

345. **Lissochilus Johnsoni**, *Rolfe* ; a *L. Andersoni*, Rolfe, labello latiore et disco 9-carinato differt.

Rhizoma crassum. *Folia* non vidi. *Scapi* erecti, 45-70 cm. alti, basi vaginis paucis lanceolatis obtecti ; racemi laxi, 7–9-flori. *Bracteae* lineari-subulatae, acuminatae, 1–1·5 cm. longae. *Pedicelli* 1·5–2 cm. longi. *Flores* 2–2·3 cm. longi, "albi." *Sepala* subpatentia, lineari-lanceolata, acuminata, 2–2·5 cm. longa. *Petala* erecta, parallella, elliptico-oblonga, subobtusa, 2 cm. longa. *Labellum* late ellipticum, subtrilobum ; 2 cm. longum, 1·3 cm. latum ; lobi laterales rotundati, breves ; lobus intermedius orbicularis, subundulatus, 1·3 cm. latus ; discus medio fere ad apicem carinis 9 paullo verrucosis instructus ; saccus conicus, obtusus, 6 mm. longus. *Columna* clavata, 1·5 cm. longa ; anthera subapiculata.

Tropical Africa. Gold Coast : Accra Plains, *W. H. Johnson*, 854.

346. **Lycaste peruviana**, *Rolfe* ; *L. Barringtonae*, Lindl., similis, sed pseudobulbo longiore et segmentis angustioribus differt.

Pseudobulbus oblongus, 6-angulus, 10 cm. longus, 3–5 cm. latus, 2-phyllus. *Folia* petiolata, elliptico-lanceolata, abrupte acuminata, plicata, prominenter 3-nervia, paullo undulata, circiter 23 cm. longa, 7 cm. lata. *Scapus* erectus, 14 cm. longus, vaginis angustis 2 obtectis. *Bractea* oblongo-lanceolata, subacuta, 1·5 cm. longa. *Sepala* oblongo-lanceolata, subacuta ; lateralia deflexa, 4–4·5 cm. longa. *Petala* oblongo-lanceolata, subacuta, 3·5 cm. longa. *Labellum* 3-lobum, 2·5 cm. longum ; lobi laterales angusti, obtusi vel subtruncati ; intermedius ovato-oblongus, subacutus, fimbriatus, basi subconcavus ; discus convexus ; callus carnosus, 5-carinatus, apice elevatus, obovatus, crenulatus, subconcavus. *Columna* clavata, 1·3 cm. longa.

Peru. *Forget.*

Introduced by Messrs. Sander & Sons, St. Albans, with whom it flowered in May, 1910. The sepals and petals are light tawny brown, becoming paler at the base, and the lip is nearly white.

347. **Anguloa Cliftoni**, *Rolfe* ; ab omnibus speciebus hujus generis labello unguiculato profunde trilobo et medio saccato differt.

Planta non visa (habitu generis). *Pedunculi* erecti, crassi, 16 cm. alti, basi vaginis spathaceis subimbricatis obtecti. *Bracteae* elliptico-lanceolatae, acutae, concavae, 5–6 cm. longae. *Flores* magni, subglobosi. *Sepalum* posticum elliptico-oblongum, subobtusum, incurvum et valde concavum, circiter 10 cm. longum, 5 cm. latum ; sepala lateralia orbiculari-elliptica, concava, apice angustata et falcato-incurva, subobtusa, 7·5 cm. longa, 4 cm. lata, basi breviter connata et pedi columnae adnata. *Petala* orbiculari-ovata, valde concava, apice angustata, subobtusa, 7·5 cm. longa, 4·5 cm. lata. *Labellum* unguiculatum, circiter 4 cm. longum ; unguis ligulatus, 1 cm. longus ; limbus trilobus, basi saccatus ; saccus 2 cm. latus ; lobi laterales falcato-incurvi, oblongi, breves, obtusi, circiter 8 mm. longi ; lobus intermedius late unguiculatus ; unguis 8 mm. longus, basi callo

bilobo vel obcordato instructus ; limbus basi trulliformis vel triangularis, pubescens, apice recurvus, acuminatus. *Columna* crassissima, 3·5 cm. longa, subreflexa, prominenter gibbosa, deinde basi subito reflexa et facie concava, infra antheram constricta ; alae latae, subtruncatae ; stigma marginatum, valde concavum.

COLOMBIA.

Introduced by Messrs. Charlesworth & Co., Hayward's Heath, and now in the collection of Mr. J. Talbot Clifton, Lytham Hall, Lanc., after whom it is named. The sepals and petals are lemon-yellow, the latter with a dark lurid-purple base and many transverse lines and reticulations above ; the lip is brownish-yellow, with a few brown spots on the limb of the front lobe. In the shape of the lip and column it is very different from any species previously known.

348. **Stanhopea elegantula**, *Rolfe* ; aff. *S. saccatae*, Batem., sed floribus minoribus, labelli cornubus brevioribus et epichilio subtruncato differt.

Pseudobulbi late ovoidei, irregulariter sulcati, circiter 5 cm. longi. *Folia* petiolata, elliptico-oblonga, subacuta, paullo undulata, prominenter 5-nervia ; 20–25 cm. longa, 5–7 cm. lata ; petioli 4–7 cm. longi. *Scapi* penduli, circiter 5 cm. longi, vaginis ovatis concavis subimbricatis obtecti, 2-flori. *Bracteae* ovatae, subacutae, concavae, 2·5–3 cm. longae. *Pedicelli* crassiusculi, 7–8 cm. longi. *Sepala* reflexa, concava ; posticum elliptico-oblongum, apiculatum, 4 cm. longum, 2·5 cm. latum ; lateralia suboblique ovata, apiculata, 4·5 cm. longa, 3 cm. lata. *Petala* reflexa, oblonga, obtusa, subconvexa, 3·5 cm. longa, 1·8 cm. lata. *Labelli* hypochilium profunde globoso-saccatum, 1·5 cm. longum, ore constricto et ad latera carina acuta instructo, intus radiatim glanduloso-lamelloso ; mesochilium latum, breve, apice brevissime 3-lobum, lateribus cornubus falcato-oblongis 1·3 cm. longis instructis ; epichilium late obovatum, truncatum, 1·5 cm. longum. *Columna* incurva, 3 cm. longa, alis angustis.

HABITAT unknown.

Received with a small collection of miscellaneous Orchids from Mrs. Birdwood, Dalkeith House, Twickenham, in 1907, and flowered at Kew in April, 1910. The flowers are primrose-yellow, with the base of the petals and hypochile of the lip orange, sparsely dotted with brown.

349. **Listrostachys imbricata**, *Rolfe* ; affinis *L. Zenkeri*, Kränzl., sed foliis brevioribus, sepalis petalisque subsimilibus et acutis, et labelli calcare limbo breviore differt.

Planta pusilla, caule brevissimo. *Folia* ensiformia, oblonga, obtusa, carnosa, rigida, 1–2·5 cm. longa, 5–6 mm. lata. *Scapi* suberecti, 3 cm. longi, basi vaginis distichis numerosis ovatis acutis imbricatis obtecti ; spicae densae circiter 7-florae. *Bracteae* ovatae, acutae, membranaceae, concavae, 3–4 mm. longae. *Pedicelli* brevissimi. *Flores* albi, parvi, basi bracteis inclusi. *Sepala* et *petala* subconniventia, linearia, acuta, subsimilia, circiter 4 mm. longa, apice paullo recurva. *Labellum* subulato-oblongum, subacutum, circiter 3 cm. longum, apice subrecurvum, basi latius et concavum ; calcar subinflato-oblongum, obtusum, incurvum, 2 mm. longum.

Columna brevissima ; pollinia subglobosa ; stipites basi filiformes, apice dilatati et obovati ; glandula ovato-oblonga.

TROPICAL AFRICA. Gold Coast, *J. Anderson.*

Collected by Mr. J. Anderson, and sent to Kew in 1907. It flowered in the collection in February, 1910. It is a very small plant with equitant leaves, a short inflorescence clothed with imbricating bracts, and small white flowers.

350. **Bonatea sudanensis,** *Rolfe* ; affinis *B. Phillipsii,* Rolfe, caulis parte supera haud vaginata, sepalo postico incurvo venis reticulatis differt.

Folia radicalia non visa ; caulina sessilia, elliptico-oblonga, apiculata, 17–22 cm. longa, 3–3·5 cm. lata, supra ad vaginas haud reducta. *Racemi* 5-flori. *Bracteae* oblongo-lanceolatae, acuminatae, convolutae, 3 cm. longae, reticulato-venosae. *Pedicelli* 4–5 cm. longi. *Flores* magni. *Sepalum* posticum et petalorum lobi postici in galeam conniventes ; galea elliptico-lanceolata, acuminata, incurva, 2 cm. longa, venis reticulatis ; sepala lateralia petalorum lobis anticis labello et processibus stigmaticis elongatis supra medium adnata, circa 2·5 cm. longa, basi angusta, sursum dilatata, falcato-triangularia, deflexa, oblique apiculato-acuminata, reticulato-venosa. *Petala* profunde bipartita ; lobus posticus linearis, acutus, 2 cm. longus, lobus anticus elongato-linearis, 3 cm. longus. *Labellum* 4 cm. longum, tripartitum, lobis linearibus ; calcar incurvum, cylindricum, circiter 10 cm. longum. *Columna* 1 cm. longa, apiculata. *Rostellum* galeatum, apiculatum, apice incurvum, marginibus denticulatis, lobis lateralibus incurvis et in lobos 2 laterales longissimos rectos ascendentes productis. *Pollinia* lineari-oblonga, basi in caudiculas longissimas extensa. *Stigmata* spathulata, circiter 2·3 cm. longa.

SUDAN. Erkowit, *F. S. Sillitoe,* 1464.

XXIV.—MISCELLANEOUS NOTES.

MR. J. W. ANDERSON, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Curator in the Botanic Gardens, Singapore.

Rosa gigantea.—At last this Burmese rose has flowered at Kew, the large plant of it in the Himalayan section of the Temperate House having, during May, developed a few flowers on the young growths at the top. This plant has grown with exceptional vigour every year since it was planted at the foot of a pillar 15 years ago, and it has now a stem which measures 7 inches in circumference a few feet from the ground. For years there was a plant of it in the Succulent House (No. 5), a position chosen for it by the late Sir Henry Collett, but although it made a strong growth of stem and branches there it never flowered. There is a good figure of this rose in the *Botanical Magazine,* t. 7972 (1904), which was prepared from a plant grown in a greenhouse in the garden of the Duke of Northumberland, Albury Park, Guildford. The flowers are single, white, and 6 inches across.

Cycas Micholitzii.—A female specimen of this interesting cycad is now bearing a ring of 15 carpophylls, and can be seen in the Water Lily House, No. 10.

Some specimens of this species, collected by Mr. W. Micholitz in Annam, were presented to Kew by Messrs. Sander and Sons of St. Albans. During the spring of 1908 several of the plants produced male cones, and one of these formed the subject of a plate (t. 8242) in the *Botanical Magazine* for March, 1909. As no living carpophylls of this species have been seen in England before, and as they shew some features which have not hitherto been noticed, it may be of interest to give a brief description of the carpophylls produced at Kew. Of the 15 scales, which form a ring at the apex of the stem, three are small and barren, and the remainder, which are fertile, bear about 40 ovules. The fertile scales are from 3–4 inches long by about 1 inch broad, of a deep green colour, and covered on both sides with a fuscous tomentum, similar to that on the petioles. The pectinate fringe is composed of sharply pointed, dark-green teeth $\frac{1}{2}$-inch long, glabrous, and with brown hard tips; a few of the teeth are forked. Some 10–15 teeth occur on each carpophyll. The seeds are glabrous, polished, and of a blackish-green colour. The species was first described in *Gard. Chron.*, 1905, vol. xxxviii., p. 142, figs. 48, 49.

Trees at Claremont.—It is a considerable distinction for a garden to possess the finest specimen in the kingdom of even one kind of tree, but Claremont has within its boundaries four or five for which we believe precedence may be claimed over all others of the same species in the British Isles. Writing in 1838, J. C. Loudon observed that Claremont at that time contained "a great many exotic trees, particularly cedars of large dimensions, very large cork oaks, tulip-trees and others of foreign origin" which had been planted by "Capability" Brown for the great Lord Clive about 1768. Many, no doubt, that were in their prime in Loudon's time have since disappeared. Claremont, as is generally known, is now the residence of H.R.H. the Duchess of Albany, and it is gratifying to know that Her Royal Highness takes a keen interest and pleasure in her trees and their preservation. Some valuable specimens have been promised for the new Museum of British Forestry now in course of formation at Kew.

Gymnocladus canadensis (Kentucky coffee tree) is represented by the finest specimen in the British Isles. It is over 60 feet high and its trunk is 7 feet in girth. *Sassafras officinale* with a trunk girthing 7 feet 2 inches (at one foot from the ground) and a height of about 50 feet, is the only fine specimen in the kingdom. *Magnolia macrophylla*, whose extraordinary leaves are often 2 to $2\frac{1}{2}$ feet long and 9 or 10 inches wide, is 40 to 45 feet high and the trunk 2 feet 11 inches in girth. This tree is exceedingly rare in Britain and we know of no other that approaches these dimensions. A specimen of Redwood (*Sequoia sempervirens*) is in perfect health and shape. It is over 100 feet high and its trunk is 13 feet 7 inches in girth, clothed from base to summit with branches and forming a slender

pyramid. These four trees we believe are unrivalled in our islands, and scarcely inferior of its kind is an immense *Pterocarya caucasica*, equalling the splendid trees near Vienna. It branches very low down and the short trunk is over 19 feet in circumference; the head is about 50 feet high with a diameter of 100 feet. This tree flowers freely. According to Mr. Elwes it is surpassed by a tree at Melbury, Dorset. Of the cork oaks (*Quercus Suber*) mentioned by Loudon, one huge specimen at least remains; its trunk is 8 or 10 feet high and 13 feet 10 inches in girth, bearing a wide-spreading head of branches which is, unfortunately, badly damaged on the south-west side.

The following specimens whilst not the finest of their kind are certainly in the very first rank among British trees:—*Magnolia acuminata* 60 feet high, 5 feet 10 inches in girth. Deodar (*Cedrus Deodara*) 8 feet 5 inches in girth. Bishop's Pine (*Pinus muricata*) 80 feet high, 7 feet 10 inches in girth. *Cryptomeria japonica* 60 to 65 feet high, 8 feet in girth. *Cunninghamia sinensis* rarely seen in good form is here a shapely tree 35 feet high and 3 feet 10 inches in girth.

Of smaller growing species, there are three excellent specimens of the broad-leaved holly, *Ilex latifolia*, 16 feet high and bushy; *Buxus balearica* 18 feet high and 9 feet through; and the Nepal Juniper (*Juniperus recurva*) with an umbrella-like head of branches 22 feet across.

W. J. B.

Cupú-açú.—At a meeting of the Linnean Society on April 7th, "a new fruit obtained in London, presumably of *Theobroma grandiflorum*, Schum." was exhibited by the General Secretary on behalf of Mr. William P. D. Stebbing. *T. grandiflorum*, K. Schum. is a tall tree, native of the Amazons region. It is known in Brazil under the native name Cupú-açú (Cupú-assú), which is also applied to *T. bicolor*, Humb. et Bonpl. According to Prof. J. W. H. Trail, who was present at the meeting, Cupú-açú means "large Cupuá,"* Cupuá being an Indian name applied to species of *Theobroma*. Dr. J. Huber in his "Notes on the fruit-trees of Pará" (Bol. Mus. Paraense, vol. iv., 1904, p. 394) gives a short account of *T. grandiflorum*, of which the following is a rough translation:—

"The Cupuaçú (*Theobroma grandiflorum*, Schum.) is one of the most important fruit-trees of Pará. In the city of Belem one rarely finds a quarter in which this tree is not cultivated. It grows best in slightly shady places, inasmuch as it suffers from diseases and parasitic† plants when much exposed to the sun. The Cupuaçú is interesting from various points of view. Its flowers, which are not borne on the trunk but on the young branches, are the largest in the genus. Its fruits, which are undoubtedly the largest in the genus are globose or more frequently ellipsoid or cylindric, and

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* The final a of Cupuá is dropped in combination with açú.

† Prof. Trail suggests that epiphytic plants are included under the term "plantas parasitas."

furnished with a hard woody shell. The pulp which surrounds the seeds is even more succulent and much more aromatic than in the cacao fruit, and furnishes excellent cooling drinks and preserves. The native country of the Cupuaçú is certainly the Amazons region and probably the Lower Amazons. I have found the tree in a wild state in the woods between Bragança and Ourem.

"Much more frequent in a wild state is an allied species, the Cupuahy (*Theobroma subincanum*, Mart.), the flowers and fruits of which are like those of the Cupuaçú in miniature. This species is very common in the woods of 'terra firme' in the Lower Amazons. . . . . Its fruits serve the same purposes as those of the Cupuaçú."

According to Prof. Trail, the name Cupuá-í means "small cupuá."

The Cupú-açú was noticed by Edwards (Voyage up the river Amazon, 1847, p. 66) between Pará and Vigia:—"We strolled into the woods, and returned with a number of the fruits called cupuassu. These are of the size and shape of a cocoa-nut in the husk, and within the shell is a fibrous, acid pulp, of which a delightful drink is made, much like lemonade. The producing tree is common in the forest, and of great size and beauty."

Bates noticed the Cupuá-í and other species of *Theobroma* near Santarem (The Naturalist on the river Amazons, 1863, vol. ii, p. 49):—"I was much struck with the variety of trees with large and diversely-shaped fruits growing out of the trunk and branches, some within a few inches of the ground like the cacao. Most of them are called by the natives Cupú, and the trees are of inconsiderable height. One of them called Cupú-aï bears a fruit of elliptical shape and of a dingy earthen colour six or seven inches long, the shell of which is woody and thin, and contains a small number of seeds loosely enveloped in a juicy pulp of very pleasant flavour. The fruits hang like clayey ants'-nests from the branches."

Santa-Anna Nery (The Land of the Amazons, 1901, p. 92) mentions "the Capú-assú, which serves to make jams, chocolate, and a liqueur."

Glaziou in his "Liste des plantes du Brésil central" (Bull. Soc. Bot. France, vol lii., 1905, Mém. 3, p. 56) records five species of *Theobroma* as cultivated at the Quinta de São Christovão, Rio-de-Janeiro, including *T. bicolor* (Cupuassú), *T. grandiflorum* (Cupuassú) and *T. subincanum* (Cupuai).

A note on the Cupu-assu appeared in Kew Bull. 1898, 104, in which it was stated that "there are fruits of *T. martiana* in the Kew Museum from R. Spruce, marked Cupu-assu, with the information that the pulp is made into a preserve." The fruits mentioned were collected by Hanbury, not Spruce, at Cametá in the province of Pará, and examination of the accompanying leaves has shown that the species is *T. grandiflorum*, K. Schum.

The genus *Theobroma* stands in need of revision, several of the species described by Martius and Bernoulli respectively being very imperfectly known. There appears to be some confusion as to the identity of *T. subincanum*, Mart., with *T. obovatum*, Bernoulli, on the one hand, and *T. ferrugineum*, Bernoulli, on the other. K. Schumann (Mart. Fl. Bras., vol. xii, part 3, p. 77) reduces *T. obovatum* to *T. subincanum*, and states that *T. ferrugineum*,

Bernoulli (as regards the specimens collected by Poeppig) is probably the same species. The type specimens of *T. ferrugineum*, however, which are preserved in the Kew herbarium, are undoubtedly specifically distinct from *T. obovatum*; but there are unfortunately no authentically named specimens of *T. subincanum* at Kew. It may be noted in this connection that Spruce's specimen of *T. ferrugineum* bears the same native name, "Cupuá-í," as is applied to *T. subincanum*, Mart.

T. A. S.

Botanical Magazine for May.—The plants figured are *Cymbidium insigne*, Rolfe, (t. 8312); *Primula Forrestii*, Balf. f., (t. 8313); *Nothofagus antarctica*, Oersted, var. *uliginosa*, Reiche, (t. 8314); *Cornus florida*, Linn., var. *rubra*, Hort. Parsons, (t. 8315); and *Acanthopanax Henryi*, Harms, (t. 8316).

The handsome *Cymbidium*, probably the most beautiful species of the genus, was first discovered by Mr. G. Bronckart in Annam in 1901. It was afterwards sent to Messrs. F. Sander & Sons by Mr. W. Micholitz, and was distributed by them under the name of *C. Sanderi*. The plant figured was presented to Kew by Messrs. Sander, and flowered in March, 1909. The colour of the sepals and petals varies from white to rose; the pale rose lip is densely spotted with purple, and bears two yellow velvety thickened lines on the villous disk. *Primula Forrestii* has been introduced to cultivation from Western China by Messrs. Bees, Ltd., through their collector Mr. G. Forrest. The plant is densely covered with glandular hairs, and the scape bearing an umbel of sulphur-yellow flowers with a deep orange eye sometimes reaches a height of 3 feet, but in the plant figured, of which the material was supplied by Messrs. Bees, Ltd., it was only 3 to 9 inches high. The *Nothofagus* is better known under the name of *Fagus*. The genus embraces 17 species, all of which are confined to the southern hemisphere, chiefly to Temperate South America and New Zealand. *N. antarctica* is distributed from lat. 38° in Chile to Tierra del Fuego, where, as in Patagonia, it is one of the dominant trees. The variety *uliginosa* is known in Chile as "Niere." The Kew plants which supplied the material for the figure were raised from seeds received from Mr. Elwes, who collected them near Lake Meliquina. *Cornus florida*, var. *rubra* has been illustrated from a specimen sent to Kew by Mr. B. E. C. Chambers, of Grayswood Hill, Haslemere. The large showy bracts are rosy red. *Acanthopanax Henryi* is a hardy shrub, with usually 5-foliolate leaves and heads of flowers and fruits closely resembling those of the ivy. It is a native of Central China, and has been introduced by Messrs. James Veitch & Sons. The bark of the root is used in China as a drug.

Botanical Magazine for June.—The plants figured are: *Agave Franzosini*, Nissen (t. 8317); *Fouquieria splendens*, Engelm. (t. 8318); *Kalmia cuneata*, Michx. (t. 8319); *Scutellaria violacea*, Heyne (t. 8320); and *Cirropetalum biflorum*, J. J. Smith (t. 8321).

Agave Franzosini is a remarkably fine species which has been figured from material sent to Kew from the late Sir Thomas Hanbury's interesting garden at La Mortola, where it has been in

cultivation since 1878. Previous to that year the species had been introduced into the garden of Mr. Francesco Franzosini at Intra on Lago Maggiore. It is a native of Mexico or Central America. The inflorescence—a panicle which has a diameter of about 10 feet—reaches a height of almost 40 feet. *Fouquieria* is a genus of considerable taxonomic interest and so singular in the structure of its flowers that the opinions of various botanists have differed very widely as to its proper systematic position, and accordingly it has been placed in several distinct natural orders.

Fouquieria was originally described by Bonpland and Kunth in 1823. The authors, after comparing it with genera belonging to five or six widely different orders, suggested that it might represent a new natural order coming in between *Portulacaceae* and *Crassulaceae*. Five years later A. P. De Candolle taking up their suggestion based upon the genus the new order of *Fouquieraceae*, placing it next to *Portulacaceae*, but pointing out at the same time that in the flower *Fouquieria* approached *Crassulaceae*, and in the fruit *Turneraceae* and *Loasaceae*. Bentham and Hooker in their Genera Plantarum reduced the *Fouquieraceae* to a tribe of *Tamaricaceae*. The same position was assigned to it by Niedenzu in Engler and Prantl's Natürliche Pflarzenfamilien, but later on Engler restored the natural order of *Fouquieraceae*, placing it next to *Tamaricaceae*. Van Tieghem, on the other hand, after examining their anatomical and morphological structure, came to the conclusion that the order should stand by the side of *Styraceae* and *Diospyraceae*. Finally, Nash, who recently monographed the order, thought it was much more closely allied to *Polemoniaceae* than to *Tamaricaceae*. The reasons given by the authors for assigning this or that position in the system rest either on superficial resemblances or on purely theoretical considerations of the value of certain characters, and the fact remains undisputed that the family occupies an isolated position without any very clear indication of relationship among the *Choripetalae*, and still less so among the *Gamopetalae*. *F. splendens* is a native of Northern Mexico and the South-Western United States. The plant—a spiny shrub reaching a height of 20 feet—has flowered in the Royal Botanic Garden, Glasnevin, whence material for the figure was sent by Mr. F. W. Moore. *Kalmia cuneata* comes from Carolina, and like other species of the genus it is a beautiful shrub. The plant figured was raised from seed presented by Professor Sargent of the Arnold Arboretum in 1904. *Scutellaria violacea* is a somewhat variable plant, native of India and Ceylon, producing elongated racemes of violet flowers, blotched with white on the lower lip. It was introduced to Kew by means of seeds received in 1900 from the Botanic Garden at Hakgala, Ceylon. The *Cirrhopetalum* is well characterised by its constantly 2-flowered scapes. Its flowers are large and showy, densely purple-dotted. The species is a native of the mountains of Java, and the specimen figured is one that was presented to Kew in 1908 by the Hon. W. Rothschild, of Tring.

The Grain Tree.—An enquiry has recently been received at Kew from a correspondent as to the identity of the Grain tree, which occasionally figures as a bearing in heraldic devices. Three sprigs

of this tree forms the crest of the Worshipful Company of Dyers, the description of the crest being—

"On a wreath of the colours, three sprigs of the grain tree, erect vert, fructed gules" :—that is to say, a plant with green leaves and red berries.

Application was therefore made to the Dyers' Company for information, but the Clerk informed us that nothing could be found in the records of the Company which would throw any light on the identity of the tree; he added that in the Coat of Arms the three sprigs look exactly like Holly.

As the Holly tree appeared to have no logical connection with the arts of dyeing, some other explanation was looked for and the connection of the word 'grain' with the Cochineal insect gave the clue to the true nature of the grain tree.

The arms of the Dyers' Company were, however, granted in the XVth Century, probably between 1420–1450, so that it is clear that the Mexican Cochineal (discovered in 1518), could not be concerned, and that the grain tree is not an *Opuntia*.

The word 'grain' appears to have become associated with the Cochineal on its discovery on account of its having been used for the crimson dye material obtained from the 'Kermes' or *Coccus Ilicis*, which was well known in Europe from very early times. Pomet in his "History of Druggs," ed. 2. London, 1725, p. 15, pl. 8, fig. 36, describes "the scarlet grain or Alkermes" as follows :—

"The scarlet grain, which the *Latins* call *Grana Tinctorum*, the *Greeks*, *Coccus Infectorius*, and the Arabs, *Kermen* or *Kermes*, is the seed, or rather excrement, of a little shrub whose leaves are prickly, almost like those of Holy-oak. They are found in great quantities in *Portugal*, *Spain*, *Provence*, and *Languedoc*."

He points out that when the seed grows old it engenders an insect which will eat it up . . . . . and it loses all its virtue.

In the account of the Cochineal or Cochenille, the grain is spoken of as the seed of the plant, "though some people affirm the Cochenille is a little animal or insect."

The origin of the term 'grain' in the case of the Kermes dye, is thus due to the ancient belief that the Kermes was really the seed of the tree and not on account of the granular appearance of the dried insect as is sometimes stated. The word 'ingrain' is connected with this derivation and refers originally to the 'fastness' of the dye obtained from this source. Thus Olivia, in "Twelfth Night," I. v. 255, "'Tis in grain, sir; 'twill endure wind and weather."*

Grains of Cochineal are still spoken of in the trade, and owing to the greater cheapness of the Cochineal dye, the ancient and probably faster dye from the 'Kermes' has fallen into disuse.

The 'little shrub,' the host of the scarlet grain, is thus *Quercus coccifera* or Kermes Oak and is the grain tree of Heraldry. That it should have been confused with the Holly is not altogether surprising since the prickly leaves of this oak with the berry-like Kermes certainly suggest that plant. In Hayne's "Gewachse," Berlin, 1833, Bd. xii., Pl. 44, an interesting account of the Kermes

* *See* also "Comedy of Errors," III., ii., 108.

Oak is given, and there is a figure of a branch of the oak with the red berry-like "Kermes-schildläusen." According to Hayne, the insect nature of the berries was demonstrated as early as 1530, but later this was disbelieved and their vegetable origin was asserted. He adds that the insect is now known as *Coccus Ilicis* of Fabricius or *Coccus quercus coccifera*e of Nees v. Essenbeck.

Eastlake, in his "Materials for a history of Oil Painting," Vol. I., 1847, pp. 115, 116, gives some interesting information on the subject. "Chaucer in the 'Nonnes Preestes Tale' alludes to it [grain dye] thus

> "He looketh as a sparhauk with his eyen
> Him needeth not his colour for to dien
> With brazil, ne with grain of Portingale."

"The insect called Kermes by the Moors furnished the colour and name of crimson (kermesius, cremesius); sometimes called grain from the prepared material.

"The grain of Portugal was celebrated from the time of Pliny to that of Chaucer.

> "Granum . . . circa Emeritan Lusitaniae in maxima laude est.—L. ix. c. 65."

"The word Vermiculus, the older form of vermillion, also refers to this insect in the earlier treatises."

Loudon in Vol. III. of his "Arboretum et Fruticetum Britannicum," pp. 1909–1911 gives some additional information about the Kermes Oak.

"In its natural state," he records, "the kermes is of a shining appearance and of the colour of a plum with whitish bloom. In the state in which it is brought into the market it appears of a dull reddish-brown, which is not of course the colour of good Chermes but is imparted to it by steeping it in vinegar."

He adds further that "The merchants who produce the Kermes immediately steep them in vinegar, and then expose them to the action of heat sufficient to destroy any remaining vitality in the young: this process considerably alters the colour of the insect, and gives it that red hue for which it has been so long celebrated."

Quercus coccifera, according to Loudon, p. 1908, was cultivated in Britain previously to 1683, and "is well known as producing the Kermes, or scarlet grain, of commerce."

A further reference to 'grain' as a colour occurs in Shakespeare

> "I will discharge it in . . . . . your purple-in-grain beard . . ."
> —*Bottom*, in "Midsummer Night's Dream" I., ii., 97.

African Bass or Piassava (*Raphia vinifera*, Beauv.).—In the *Kew Bulletin* for 1891, pp. 1–5, is recorded the history of West African Bass fibre from the Colony of Lagos, and in the same publication in the year following, pp. 299–300, appeared a further note on the shipment of this fibre from Appam, a port on the Gold Coast. Several kinds of the fibre are now regularly exported from various ports in West Africa and quite recently some 3000 bundles of the fibre were submitted to auction in Liverpool.

In the Monthly Consular and Trade Reports of the United States of America, No. 352, 1910, p. 213, the following interesting

details are given of the industry in this product in Liberia :— "Piassava was discovered about 1889 by J. H. Hugges, of Grand Bassa, Liberia, and was introduced to the commercial world in 1890. The value of this product was immediately appreciated in Europe, and for some years commanded the high price of $288 to $336 per ton. Just as the settlements in Montserrado County once flourished from the coffee industry, Grand Bassa, with its piassava, assumed the primacy in Liberian export trade and became the headquarters for the industry of the West Coast of Africa. The large profits attracted the aboriginal population by the thousands throughout the Republic, and by 1904 piassava had overtaken coffee and was the chief article of Liberian export. For a number of years this Republic was the only country from which piassava was secured. It proved, however, to be such a profitable industry that Liberia was brought into keen rivalry with the piassava from European dependencies in West Africa and fibre-producing countries of South America. This forced the price down at times to as low as $48 a ton.

"*Preparation of Piassava.*—Piassava fibre is secured from the Raphia palm (*Raphia vinifera*). Indigenous to the country, it grows in abundance in Grand Bassa, and is found in every county of the Republic. The fronds or branches of the tree are cut up into the desired lengths and placed in water—preferably running—to remain until all of the substance except the fibre has decayed. When sufficiently decayed, the branches are beaten until the fibre is free of all extraneous matter, then cleaned by being drawn through nails closely driven in a board rack. After being sun-dried the fibre is ready for market. The profits were so great and the preparation so simple that many who rushed into the industry adopted faulty methods, which left the fibre half cleaned. This materially assisted outside competition in bringing down the price of Liberian piassava. The merchants divide the products into the first and second grades.

"*The Export Trade—Commercial Uses.*—The rapid decline of coffee was attended by the equally rapid rise of piassava. However, poor methods of preparation and foreign competition soon materially reduced prices, and, quickly following in the wake of coffee, piassava receded from its primacy in Liberian trade. The local merchants now pay in cash 1½ to 2 cents per pound for the fibre and 2 to 2½ cents in goods, according to quality. The price in Liverpool this season is $62·40 to $84 per ton, against $57·60 to $97·20 at this time last year. These low prices are causing Liberians to turn to more lucrative productions. The amount of fibre exported in 1908 was as follows :—

Quarter.	Pounds.	Value.
		Dollars.
First	2,297,512	48,022
Second	1,843,319	52,698
Third	531,199	48,420
Fourth	2,697,832	54,168
Total	7,369,862	203,308

"The commercial use of piassava fibre is chiefly in making brushes and brooms, yet it may be used for baskets, in street-sweeping machines, for cordage, bottoms for chairs, etc. The *Raphia vinifera* produces an ivory nut with a hard outer covering from which Africans make rings and other articles for decoration and dress. Piassava is tied up at both ends and in bundles from 2 to 3 feet long, much like American wheat. It is remarkable how strong is this fibre and how well it resists decay and endures the wear and tear of the roughest work.

"In exchange for American cotton goods and provisions, thousands of pounds of this piassava may be had at almost every Liberian port. The aboriginal as well as the Americo-Liberians are anxious to secure American products, and for them they show a decided preference. In case American exporters seek to extend trade in this district consideration should be given to piassava fibre."

Under date March 8th, Messrs. J. H. Rayner & Co., Produce Brokers of Liverpool, in their weekly report, state, in reference to this fibre, that recent arrivals per "Fulani," amounting to 1500 bundles, were offered at public auction on the preceding Friday; there was very fair competition and the bulk sold at full prices as follows:—

	£	s.	d.		£	s.	d.	
Grand Bassa	18	10	0	to	21	15	0	per ton.
River Cess	21	5	0					"
Junk River	20	0	0	"	21	0	0	"

Sherbro and Gaboon sorts on private terms since the auction.

Specimens illustrating the economic uses of this Palm will be found in Case 51, Museum No. II.

J. M. H.

Algological Visit to Achill and Clare Island.—In April, 1909, Mr. Cotton, Assistant, Cryptogamic Department, was able to pay a visit to Achill and Clare Island. The report submitted by him is here reproduced.

On Wednesday, April 7th, I left London by the night mail and reached Achill at 1 p.m. the following day. I worked the sand-banks and channels left dry during the low spring tide that afternoon, and proceeded to Clare Island in the evening. On Clare Island various positions were selected for collecting purposes and a large number of specimens were gathered, laid out, and dried for the Herbarium. Special attention was paid to species and varieties of *Callithamnion*, *Polysiphonia* and *Ectocarpus* with a view to the systematic revision of these genera. Care was also given to the collection of certain microscopic algae which are poorly represented in the Herbarium.

Amongst the larger algae collected were several specimens of the Mediterranean *Codium elongatum*, only once previously found in the British Isles, and the very rare *Leathesia crispa*, which, except for specimens presented quite recently, was entirely unrepresented in the Herbarium; whilst amongst the microscopic algae obtained, several will almost certainly furnish the first British examples for Kew. The known distribution of other species was extended.

On Saturday, April 18th, I returned to the mainland, and from Achill visited, by cycle, various localities for collecting. Parts of Achill Sound, Bellacraghy Bay, and Mallaranny in Clew Bay provided interesting and very luxuriant specimens. A short time was also spent collecting fungi.

Both on Clare Island and on the mainland, considerable atttention was given to the distribution of the algae with regard to the exposure of the coast, nature of substratum, light, depth and salinity of water, and other points of biological importance.

A. D. C.

'Die-back' of Hevea brasiliensis.—An account of this disease is given in Circular No. 23, Royal Botanic Gardens, Ceylon, by Mr. T. Petch. When first observed it was essentially a disease attacking young trees from one to two years old. Recently, however, it has assumed a more serious aspect, attacking trees from nine to fourteen years old, and in some cases it has killed these with astonishing rapidity. The disease kills back the tree from the top, the leading shoot being attacked first at some distance below the apex. The place attacked becomes dark brown, and this discoloration gradually extends over the whole shoot, while the leaves fall off as the fungus reaches them. The brown patch is frequently rather soft, but hardens afterwards and turns grey. The fungus causing this disease forms its fruit just beneath the epidermis, which is raised in very minute swellings that burst at the top and liberate the spores, leaving minute holes which make the shoot rough. The fungus is called *Gloeosporium alborubrum*, Petch. If the dead top shoot is cut off, the tree sends up a new leader, and but little damage is done. If neglected, the "die-back" frequently continues down the stem until it reaches the root, and the tree is killed.

The disease is complicated by the attack of a second kind of fungus. After the death of the leading shoot, the second fungus—*Lasiodiplodia theobromae*, Griff. & Maubl. (= *Diplodia theobromae*, Petch, and *Diplodia cacaoicola*, Henn.), may enter the dead shoot, and grow downwards in the woody stem, gradually killing it down to the base. From the above account it will be seen that the disease is primarily due to the *Gloeosporium*, and completed by the *Lasiodiplodia*. The latter fungus can also live on dead leaves and dead stems of *Hevea*, hence promptitude in removing such is of primary importance, and the removal of dead branches should also be attended to. All diseased material should be promptly burned.

When branches are removed the wounded surface should be tarred to prevent the entrance of fungi. For some undetermined reason, the fungus does not attack the tapped surface.

G. M.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1910.

XXV.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

III. New Chinese Species.

The following notes on new additions to the collections of ligneous plants have been prepared in continuation of those already published in the *Kew Bulletin*, 1909, p. 353, and 1910, p. 45.

Larix Potaninii, *Batalin* [Coniferae].

Messrs. Veitch have recently presented to Kew a healthy plant of this interesting and extremely rare larch, one of a batch growing in their Coombe Wood nursery raised from seed sent from China by Wilson in 1904. There appear to be only two species of larch in China, namely, *L. chinensis*, Beissner, about which little is known in this country but which appears to be in cultivation on the continent, and the one under notice. *L. Potaninii* is a tree reaching 60 to 70 feet in height, with a trunk 2 feet in diameter; it is a native of Szechuan, near Tatienlu, and is said to produce the most valuable timber in the west of China. Several of the larches are very similar to each other in the leaves and general appearance, but Mr. Henry distinguishes this by its having the leaves deeply keeled on both surfaces, and by the branchlets being light yellow. The cone is cylindrical, $1\frac{1}{2}$ to $1\frac{3}{4}$ inches long, about 1 inch wide; the scales are roundish, $\frac{1}{3}$ inch long, and beyond them the bracts protrude about $\frac{1}{4}$ inch. The leaves are 1 inch or less in length. Coming from altitudes up to 11,500 feet, this larch will, no doubt, prove to be as hardy as any species in cultivation.

By the kind permission of Professor Sargent, Arnold Arboretum, Harvard University, photographs of this tree and of the following species (*Meliosma Veitchiorum*), taken by Mr. E. H. Wilson, in China, are reproduced on the accompanying plates.

Meliosma Veitchiorum, *Hemsley* [Sabiaceae].

Few trees introduced by Mr. Wilson from China are of such great interest and promise as this. The Natural Order to which it belongs is only represented among hardy trees and shrubs by the

(16730—6a.) Wt. 92—428. 1375. 7/10. D & S.

genus *Meliosma*, and until recent Chinese explorations, that genus was only known in the out-door garden by a single rather tender species—*M. myriantha*. *M. Veitchiorum* is a deciduous tree 40 to 50 feet high with very thick young shoots covered with a rust-coloured pubescence. The leaves are pinnate, 2 to 3 feet long, with usually 9 or 11 leaflets, the largest of which are 6 to 8 inches long, 3 to 3½ inches wide, ovate or oblong, pointed. The flowers are white, small (⅛ inch in diameter) and appear in an erect terminal panicle, or cluster of panicles, pyramidal in outline and up to 18 inches high.

As a foliage tree, this new species—which was discovered for Messrs. Veitch in South Wushan, W. China, and introduced in 1900, promises to equal the finest of the walnuts, sumachs, and other popular pinnate-leaved trees in cultivation, and it promises a considerable beauty of flower also. There are exceedingly few trees in Europe, but Messrs. Veitch have kindly presented one to Kew. It has been planted between No. I. (Aroid) House and the Main Entrance to the Gardens. So far as can be judged at present, it is quite hardy. Mr. Wilson found it in flower in June at elevations of 5000 to 7500 feet.

Portya sinensis, *Oliver* [Compositae]; Hooker's Icones Plantarum, t. 224.

Whilst this shrub is not likely to become in any way popular in gardens, it is an interesting addition to the hardy shrubby *Compositae*, which at present form but a small group in gardens. It was originally discovered in the province of Hupeh, China, by Mr. A. Henry, in 1889, and was again found by Mr. Wilson in 1901. From seeds sent home by him to Messrs. Veitch, plants were raised at Coombe Wood, one of which was presented to Kew, where it has proved very hardy and flowers in June annually. It is a deciduous shrub, 4 to 6 feet high, of bushy habit with slender ribbed branches. Leaves alternate, ovate-lanceolate, acuminate, 2 to 3 inches long, ¾ to 1 inch wide, on the shoots of the year; but on the year-old branches produced four or six together in fascicles, and less than half the size of the others. Flower-heads pink, ½ inch across, surrounded by an involucre of oval, membranous, imbricating scales, solitary in the centre of each fascicle of leaves and produced on a slender peduncle ½ to 1 inch long. The young leaves are extremely bitter.

Picea complanata, *Masters* [Coniferae].

The spruces belonging to the *Omorika*, or flat-leaved section of the genus, exist in curiously separated parts of the globe. The best known and commonest is the Sitka spruce (*P. sitchensis*), from N.W. America, and for a good many years two or three from Japan and one from S.E. Europe (*P. Omorica*), have been in cultivation. Recently, a Himalayan species (*P. morindoides*), has been discovered in various gardens. The last comer is *P. complanata*, found by Wilson in Western Szechuan in 1901, and introduced at the same time to the Coombe Wood nursery. Messrs. Veitch have recently presented a plant to Kew.

In its foliage *P. complanata* very much resembles *P. sitchensis* and *P. morindoides*, having needle-shaped leaves ¾ to 1 inch long,

LARIX POTANINII.

MELIOSMA VEITCHIORUM.

To face page 175]

with the glaucous lines of stomata on one side (the upper one) only. The cones, of course, are only known from Wilson's collected specimens; they are cylindrical, but taper towards both ends and are 4 to 5 inches long, 1¼ inch wide in the middle, the scales somewhat oyster-shell-shaped, slightly toothed on the upper edge. As this tree grows at elevations up to 8000 feet in Western Szechuan, where it constitutes whole forests, it will, no doubt, prove quite hardy in this country.

Pyrus Folgneri, *C. K. Schneider* [Rosaceae].

Among the numerous forms of *Pyrus* introduced from China by Wilson for Messrs. Veitch, this stands out as a particularly promising acquisition for gardens. As seen in the Coombe Wood nursery, it is a slender tree with graceful, often pendulous branches, and according to Mr. Henry, who first discovered it in Hupeh, it varies from 10 to 30 feet in height. The leaves are of the *Pyrus Aria* type, oval, tapering towards each end, 2 to 3½ inches long, ¾ to 1½ inches wide, serrulate, dark green and glabrous above, covered beneath with a vividly white felt. Flowers white, in lax corymbs, followed by red, egg-shaped fruits ¼ inch long. This tree belongs to the *Micromeles* group of *Pyrus*, which is nearly allied to the *Aria* group, but differs in the much smaller flowers with an epigynous (not perigynous) disk, and in the small fruits crowned with a ring-like scar left by the fallen calyx.

For gardens the graceful habit and slender, often whip-like branches, the white undersurface of the leaves and the abundant clusters of red fruits unite to make *Pyrus Folgneri* a very attractive small tree. It has recently been presented to the Kew collection by Messrs. Veitch.

Staphylea holocarpa, *Hemsley* [Sapindaceae].

The Staphyleas or Bladder-nuts are already represented in gardens by two popular species—*S. pinnata* and *S. colchica*—and by a hybrid between them, *S. Coulombierii*. There are also two or three other species of less note. *S. holocarpa* is a new species first discovered about 1887 by Mr. A. Henry in the province of Hupeh, Central China, and was described by Mr. Hemsley in the *Kew Bulletin*, 1895, p. 15. Nothing more was heard of it until Mr. Wilson's last journey to China, when he collected an abundance of seeds, some of which were presented to Kew in 1908 and germinated freely. It promises to be a taller and stronger grower than any of the older species. Mr. Wilson tells me he saw it occasionally 30 feet high—a genuine tree with a well-formed trunk. The leaves are glabrous, except when quite young, and are composed of three distinct leaflets, which are narrowly oval, finely toothed, 2½ to 4 inches long, 1 to 1¾ inches wide, the petiole 2 to 3 inches long, the lateral pair of leaflets almost sessile, the terminal one stalked. Flowers pink, each ½ inch long, produced in corymbs 1 to 2 inches long and wide. The capsule has the bladder-like form characteristic of the genus, and is pear-shaped and 1½ to 2 inches long. Plants raised from seed in the spring of 1908 have withstood the two past winters without injury. It is unfortunate that, owing probably to a clerical error when the seeds were distributed, this plant is growing in several collections as "*S. lobocarpa*."

Syringa pinnatifolia, *Hemsley* [Oleaceae].

Although for many years there has been in cultivation a variety of the Persian lilac with pinnatifid leaves, a species with genuinely pinnate leaves is a distinct novelty. *S. pinnatifolia* was discovered in Western China by Wilson in 1904, and was introduced by him for Messrs. Veitch. According to its discoverer it is a bush 6 to 8 feet high, with slender branches and very elegant habit. The leaves are 2 to 3 inches long, composed of seven to eleven leaflets, which are sessile, ovate-lanceolate, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, $\frac{1}{4}$ to $\frac{3}{8}$ inch wide. The flowers are white with a slight tinge of lilac, produced in axillary panicles $1\frac{1}{2}$ to 3 inches long. The corolla is of the ordinary narrowly tubular shape, $\frac{1}{2}$ inch long, the spreading lobes $\frac{1}{8}$ inch long. The terminal portion of the leaf frequently shows a tendency to become pinnatifid instead of wholly pinnate. The species, which has recently been added to the Kew collection by the kindness of Messrs. Veitch, will no doubt be hardy, and will probably prove as ornamental in gardens as the white Persian lilac.

Tripterygium Wilfordi, *Hook.* f. [Celastraceae].

In June, 1858, Charles Wilford, a young man then collecting for Kew in Formosa, first discovered this shrub on the banks of the river Sanar, on the north-west side of that Island. It was again collected in 1864 in Formosa by Wilford's successor, the clever but ill-fated Richard Oldham, and since then it has been found in Corea, Japan and (by Mr. Henry) in Yunnan. But no attempt appears to have been made to introduce it alive until 1905, when Mr. J. G. Jack, of the Arnold Arboretum, visiting Corea, collected it and introduced it to the United States. Since then it has been sent to Kew by Professor Sargent.

It is a vigorous climbing shrub with angular, warty stems and deciduous alternate leaves, which are broadly ovate, long-pointed, cuneate or obliquely truncate at the base, crenately toothed, the largest 6 inches long and 4 inches wide; the smallest only one-quarter those dimensions. Flowers white, produced in panicles of varying size at the end of the shoot and in the axils of the terminal leaves, the whole making an inflorescence 6 to 12 inches long. Fruit three-angled and with three erect longitudinal wings; the wings $\frac{3}{4}$ inch long and $\frac{1}{4}$ inch wide. The fruit has little ostensible resemblance to the other hardy *Celastraceae*, like *Euonymus* and *Celastrus*, and suggests more strongly a Wych Elm fruit with an extra wing. But the species, which is monotypic, belongs to the *Elaeodendron* group, which has no other hardy representative in this country.

Tsuga yunnanensis, *Masters* [Coniferae]; Gard. Chron. April 14, 1906, fig. 93. (*Abies yunnanensis*, Franchet).

Any addition to the group of handsome and graceful conifers known as *Tsuga* is welcome. This new species is a native of Western and Central China and was first discovered by the Abbé Delavay in Yunnan; later collectors, including Henry, Pratt and Wilson, found it in Szechuan and Hupeh. It was introduced by Wilson for Messrs. Veitch in 1900, and from their stock at Coombe Wood a plant has recently been obtained for Kew. Its leaves are from $\frac{1}{3}$ to 1 inch long, linear with entire margins, pointed in young

specimens, becoming blunt and rounded in adult trees, with the stomatal lines faintly marked beneath. The young wood is hairy, which distinguishes it from *T. Sieboldii*; and from S. *diversifolia*, which also has hairy young wood, it differs in its longer, larger leaves. The cone is about 1 inch long and the same in width, sessile.

IV. A New Oak.

Quercus pontica, *C. Koch* [Cupuliferae].

This striking oak has long been a desideratum for the Kew collection. It is a native of north eastern Armenia, whence it appears to have first been introduced to Germany by Dr. Dieck, of the Zöschen Nursery, about twenty-five years ago. It is, however, extremely rare, and it was not until I saw it in Messrs. Späth's nursery at Berlin, in 1908, that it became possible to obtain it, for it is not offered in catalogues. There is also a good specimen in the Botanic Garden of Dresden. In the Kew Herbarium it is only represented by a single sheet containing a flowering twig and one with three fully-grown leaves.

This oak appears to be a small tree, sometimes a shrub; its leaves are oval or slightly obovate, and up to 8 inches in length and 4 inches in width, and are distinguished by reason of fifteen to twenty-five prominent ribs running parallel to each other from the mid-rib at an angle of about 40 deg. to the margin, where each one terminates in an incurved lanceolate tooth $\frac{1}{4}$ inch long. The upper surface is a bright, rather pale green; the lower one glaucous. Petiole about $\frac{1}{4}$ inch long. I have not seen the acorn either living or preserved, but it is described as being half enclosed in a cup with ovate lanceolate scales.

The affinities of the species appear to be with *Q. castaneaefolia*, but it is also comparable with *Q. Mirbeckii*, and *Q. conferta*. In the beauty of its foliage it is superior to all three.

Explanation of Plates.

Larix Potaninii, 70 feet × 6 feet; west of Tatienlu; altitude 10,800 ft.

Meliosma Veitchiorum, 45 feet × 10 feet, with votive board; Changyang Hsien; altitude 4800 ft.

XXVI.—ENTANDROPHRAGMA, LEIOPTYX AND PSEUDOCEDRELA.

T. A. Sprague.

The genus *Entandrophragma* (*Meliaceae*) was described in 1894 by Casimir De Candolle (Bull. Herb. Boiss. vol. ii. p. 582, t. 21) who based it on *Swietenia angolensis*, Welw., and distinguished it from *Swietenia* by the presence of a stipitiform disk, to which the lower part of the staminal tube was connected by means of ten longitudinal membranous partitions.

In 1895 Harms described the genus *Pseudocedrela*, which he distinguished from *Swietenia* and *Entandrophragma* by the seed being provided with a wing pointing to the base of the capsule, as against the apex (Engl. Jahrb. vol. xxii. p. 153); and in 1896 he used this character together with the nature of the insertion of the anthers in his key to the genera of *Swietenioideae* (Engl. & Prantl, Nat. Pflanz. vol. iii. 4. p. 270).

Two additional species of *Entandrophragma* were described within the next three years: *E. Candollei*, Harms in Notizbl. Bot. Gart. Berlin, vol. i. 1896, p. 181, from the Cameroons; and *E. Candolleana*, De Wild. & Th. Dur., Contrib. Fl. Congo, vol. i. fasc. 1, p. 14, from the Congo State. The capsule and seeds were unknown in both cases.

In 1905, in the course of an expedition through Buddu and the Western and Nile Provinces of the Uganda Protectorate, Mr. M. T. Dawe collected material of several important timber trees belonging to the *Meliaceae*, including two species which, in the absence of flowers, were referred to the genus *Pseudocedrela* on account of the nature of their fruit and seeds: the wing of the seed pointing to the base of the capsule. As both species were large forest trees yielding valuable timber, it was thought desirable to describe them, although flowers were not known, and they were, accordingly, published as *Pseudocedrela excelsa*, Dawe & Sprague, and *P. utilis*, Dawe & Sprague, respectively (Journ. Linn. Soc. Bot. vol. xxxvii. 1906, p. 511).

Two additional species, obviously congeneric with *P. excelsa* and *P. utilis*, were received subsequently from the Transvaal and the Gold Coast respectively, and were described as *P. caudata*, Sprague, and *P. cylindrica*, Sprague (Kew Bull. 1908, pp. 163, 257).

During a visit to the Budongo Forest early in 1910, Mr. Dawe obtained flowers of *Pseudocedrela utilis* and *P. cylindrica*, which he has forwarded to Kew. These showed the structure characteristic of *Entandrophragma*, namely, a stipitiform disk and a partitioned staminal tube. A capsule of *Entandrophragma angolense* preserved in the Kew Museum was accordingly examined and it was found that the wing of the seed pointed to the base of the capsule just as in *Pseudocedrela*. It thus became evident that the seed of *Entandrophragma* had been incorrectly described, and that several of the species published under *Pseudocedrela* would have to be transferred to *Entandrophragma*.

The mistake in the description of the seeds appears to have arisen as follows: Casimir De Candolle described the seeds as "superne alata," apparently meaning thereby that the seeds were winged at the end opposite to their place of attachment. Unfortunately, however, the phrase "semina superne alata" had been used in quite a different sense by Bentham & Hooker (Gen. Pl. vol. i. p. 338) and by C. De Candolle himself (Monogr. Phan. vol. i. p. 723), as meaning that the seeds were provided with a wing pointing to the apex of the capsule; and in this more usual sense it was naturally interpreted by Harms.

Although flowers are not known of *Pseudocedrela excelsa* and *P. caudata*, it may safely be assumed that these two species belong to

Entandrophragma, as they are obviously much more closely related to *P. utilis* and *P. cylindrica*, which are now known to be species of *Entandrophragma*, than to *P. Kotschyi*, on which the genus *Pseudocedrela* was founded.

The distinguishing characters of *Entandrophragma* and *Pseudocedrela* may now be summarised as follows :—

Entandrophragma : disk stipitiform ; lower part of staminal tube partitioned ; valves of the capsule not connected by a fibrous network after dehiscence ; cotyledons elliptic or ovate ; leaflets entire.

Pseudocedrela : disk cupular ; staminal tube not partitioned ; valves of the capsule connected by a fibrous network after dehiscence ; cotyledons obovate ; leaflets repand-dentate.

The genus *Leioptyx*, which was described by De Wildeman in 1908 (Etudes Fl. Bas- et Moyen-Congo, vol. ii. p. 258, tt. 76–77), has since been reduced to *Entandrophragma* by Aug. Chevalier (Veg. Ut. Afr. Trop. Franç. fasc. 5, p. 200). According to Chevalier, two distinct species are included under De Wildeman's description and figures of *Leioptyx congoensis : Entandrophragma Pierrei*, A. Chev., based on specimens collected at Ogowe, French Congo, by Jolly (Etudes Fl. Bas-et Moyen-Congo, vol. ii. t. 76, ff. 2–7) ; and *Entandrophragma congoense*, A. Chev., based on material collected at Eala, Congo State, by Pynaert (t. 76, ff. 1, 8–10 ; t. 77).

As Chevalier (l.c.) has described five additional species of *Entandrophragma*, none of which is represented at Kew, it is not possible at the moment to give a key to the species. In view of their economic importance, however, it seems desirable to give an enumeration of those hitherto described along with their geographical distribution, as far as it has been ascertained. The species are arranged in chronological order.

Entandrophragma, *C. DC.* in Bull. Herb. Boiss. vol. ii. 1894, p. 582, t. 21 ; Harms in Engl. & Prantl, Nat. Pflanz. vol. iii. 4. p. 273 ; A. Chev. Veg. Ut. Afr. Trop. Franç. fasc. 5, p. 200.—*Leioptyx*, Pierre ex De Wild. Etudes Fl. Bas- et Moyen-Congo, vol. ii. 1908, p. 258.

1. **E. angolense**, *C. DC.* l.c. ; Hiern Cat. Welw. Afr. Pl. vol. i. p. 135. *Swietenia angolensis*, Welw. Apont. p. 561 ; C. DC. Monogr. Phan. vol. i. p. 724.

Capsule pendulous, dehiscing from the base upwards, valves cohering above, deciduous in the form of a calyptra, then separately arching outwards. Hilum of seed linear.

Angola. Golungo Alto, *Welwitsch*, 1313! Uganda. Western Province : Budongo Forest, *Dawe*, 984 ! The specimens sent by Dawe differ somewhat from the type : the midrib on the lower surface of the leaflets being much less pilose, and the calyx rather larger (4·5 mm. in diameter). The differences observed do not seem to warrant separation as a distinct species.

According to Mr. Dawe, this species is of considerable economic importance. It is more abundant than *E. utile*, and is distributed over a considerable portion of the Budongo Forest at an average of about 1 tree to the acre.

2. **E. Candollei**, *Harms* in Notizbl. Bot. Gart. Berlin, vol. i. 1896, p. 181.

Capsule and seeds not known.

CAMEROONS. Johann Albrecht's-Höhe, *Staudt*, 459!

3. **E. Candolleanum**, *De Wild. et Th. Dur.*, Contrib. Fl. Congo, vol. i. fasc. 1, 1899, p. 14; Ill. Fl. Congo, p. 125, t. 63; Reliq. Dewevr. 41.

Capsule and seeds not known.

CONGO STATE. Stanley Falls region, *Dewèvre*.

4. **E. excelsum**, *Sprague*, comb. nov.—*Pseudocedrela excelsa*, Dawe & Sprague in Journ. Linn. Soc. Bot. vol. xxxvii. 1906, p. 511.

Position and mode of dehiscence of the capsule not known. Seeds attached in the middle of each face of the central column; hilum elliptic.

UGANDA. Western Province: West Ankole Forest, *Dawe*, 358!

5. **E. utile**, *Sprague*, comb. nov.—*Pseudocedrela utilis*, Dawe & Sprague l.c.; H. N. Thompson, Gold Coast, Report on Forests, t. 13.

Capsule pendulous, dehiscing from the apex downwards. Seeds attached in the middle of each face of the central column; hilum elliptic or narrowly oblong.

UGANDA. Western Province: Budongo Forest, *Dawe*, 786! 1002! GOLD COAST. Near Nyinahin, *Thompson*, 48!

The capsule collected by Thompson differs from the type in having the central column considerably produced above the uppermost seed.

Mr. Dawe writes of this species as follows: "*Pseudocedrela utilis* is now (mid-February) in full flower, but capsules still hang on the trees in some cases, and seeds are available although it appears rather late for them. The tree is easily recognised, not only by its distinct fruits, but by its bark, which is brownish and roughly channelled, whereas the bark of the other three (?) species [which occur in the Budongo Forest] is almost smooth, is lighter in colour and scales off in irregular pieces."

6. **E. caudatum**, *Sprague*, comb. nov.—*Pseudocedrela caudata*, Sprague in Kew Bull. 1908, p. 163.

Capsule pendulous, dehiscing from the apex downwards. Seeds attached near the middle of each face of the central column; hilum small, elliptic.

TRANSVAAL. Zoutpansberg District: Blauwberg, *Baily in Transv. Dep. Agric. Herb.*, 2926!

7. **E. cylindricum**, *Sprague*, comb. nov.—*Pseudocedrela cylindrica*, Sprague in Kew Bull. 1908, p. 257 (July 3); H. N. Thompson, Gold Coast, Report on Forests, t. 10.

Capsule pendulous. Seeds attached alternately to the right and left of each face of the central column.

GOLD COAST. Near Mansu and Supom, *Thompson*, 16! near Tsifufu, *Thompson*, 34! SOUTHERN NIGERIA. Western Province, *Thompson*, 10! UGANDA. Western Province: Budongo Forest, *Dawe*, 983!

8. **E. Pierrei**, *A. Chev.*, Veg. Ut. Afr. Trop. Franç. fasc. 5, p. 203.—*Leioptyx congoensis*, De Wild., Etudes Fl. Bas- et Moyen-Congo, vol. ii. 1908, p. 259, partly, t. 76, f. 2–7.

Position and mode of dehiscence of the capsule not known. Seeds attached alternately to the right and left of each face of the central column.

French Congo. Ogowe, *Jolly*.

9. **E. congoense**, *A. Chev.*, l.c.—*Leioptyx congoensis*, De Wild., Etudes Fl. Bas- et Moyen-Congo, vol. ii. 1908, p. 259, partly, t. 76, ff. 1, 8–10, t. 77.

Capsule dehiscing from the base upwards. Seeds attached in the middle of each face of the central column.

Congo State. Eala, *Pynaert*, 367.

10. **E. ferrugineum**, *A. Chev.*, l.c. 195, 284.

Capsule erect, according to Chevalier ; attachment of seeds not mentioned.

Ivory Coast. Middle course of the Comoé River ; Mbassa, *Chevalier*, 16261.

11. **E. macrophyllum**, *A. Chev.*, l.c. 196, 278, 280.

Capsule erect, dehiscing from the base upwards, valves cohering above, deciduous in the form of a calyptra. Seeds attached alternately to the right and left of each face of the central column ; hilum linear.

Ivory Coast. Here and there throughout the forest, *Chevalier*, 16136, 16146, 16147, 16181.

12. **E. rufum**, *A. Chev.*, l.c. 201, 278.

Capsule and seeds not known.

Ivory Coast. Here and there in the forest, apparently rather rare, *Chevalier*, 16166.

13. **E. macrocarpum**, *A. Chev.*, l.c. 203.

Position and mode of dehiscence of the capsule, and mode of attachment of the seeds not mentioned. I suspect, from the description, that this species may be conspecific with *E. utile*.

Ivory Coast. Middle course of the Sassandra River ; Guidéko, *Chevalier*, 16390.

14. **E. septentrionale**, *A. Chev.*, l.c. 205, 276, 278.

Capsule erect, dehiscing from the base upwards. Mode of attachment of the seeds not mentioned.

Ivory Coast. Fairly frequent in the forest between Cavally and Indenié and Sanwi, *Chevalier*, 16126, 16145, 16158.

15. **E.** sp.—*Pseudocedrela* sp. (near *P. cylindrica*), Thompson, Gold Coast, Report on Forests, t. 12.

Gold Coast. Near Tsifufu, *Thompson*, 36 !

Pseudocedrela, *Harms* in Engl. Jahrb. vol. xxii. 153 ; et in Engl. & Prantl, Nat. Pflanz. vol. iii. 4. p. 272.

P. Kotschyi, *Harms*, l.c. 154 ; l.c. 273.—*P. Chevalieri*, C. DC. in Bull. Soc. Bot. France, vol. liv. Mém. 8, 1907, p. 12. *Cedrela Kotschyi*, Schweinf. Reliq. Kotsch. p. 36, t. 35. *Soymida roupalifolia*, Schweinf. l.c. 37. *Boswellia* sp. ?, Oliv. in Trans. Linn. Soc. vol. xxix. p. 44.

Gold Coast. Northern Territories : Bere, *Dudgeon*, ser. II. 105! Lagos. *E. W. Foster*, 17! Northern Nigeria. Katagum District, *Dalziel*, 218! Nupe : Jeba, *Barter*, 1633! 1712! Eastern Chari. Snoussi Country : Ndelle, *Chevalier*, 7478! 7803.

Galabat. Matamma, *Schweinfurth*, 2249! Upper Sennar. Near Fazokl, *Cienkowski*, 93. Sudan. Sobat River, 20 miles below Nasser, *Muriel*, L. 104! Jur. Seriba Ghattas, *Schweinfurth*, 1333! Uganda. Nile Province : Acholi, *Dawe*, 843! Madi, *Grant*, 739!

XXVII.—DIAGNOSES AFRICANAE: XXXVI.

1091. **Thesium atrum**, *A. W. Hill* [Santalaceae] ; species nulli arcte comparanda, *T. doloensi*, Pilger, similis in sicco nigrescens sed foliis et bracteis minutis orbiculari-ovatis marginibus ciliatis distincta.

Suffrutex perennis, rhizomate lignoso ; caules plurimi, prostrati, lignosi, robusti, 30 cm. vel plures longi, rami adscendentes, in sicco nigrescentes, 10–15 cm. longi, ramulis lateralibus aliis elongatis aliis brevibus numerosis instructi. *Folia* squamiformia, orbiculari-ovata, subacuta, 1 mm. longa, carnosa, margine minute ciliolata. *Flores* versus apices ramulorum foliatorum axillarium dispositi : bracteae bracteolaeque foliosae, apiculatae, involucrum formantes. *Perianthium* album, 1·75 mm. longum, segmentis 1 mm. longis ovatis subacutis glabris paullo cucullatis marginibus membranaceis subpapillosis. *Antherae* filamentis aequilongae, 0·4 mm. longae. *Stylus* 1 mm. longus. *Fructus* in sicco ater, globoso-ovoideus, 2·5 mm. longus, 2 mm. latus, costis et venis inconspicuis.

Angola. Suassingua, *Gossweiler*, 2713 (Herb. Mus. Brit.).

1092. **Thesium brachyanthum**, *Baker* [Santalaceae] ; species distincta caulibus profunde sulcatis foliis carinatis membranaceis reductis ; *T. subaphyllo*, Engl., paullo affinis bracteis bracteolis inflorescentiisque elongatis differt.

Suffrutex, caulis erectus, 30 cm. altus, glaber, quadrangularis, angulis plus minusve alatis profunde sulcatis ramis numerosis fastigiatis. *Folia* squamiformia, ovata, acuta, 2–3 mm. longa, membranacea, conspicue carinata. *Flores* in spicas laxas elongatas terminales dispositi ; bracteae et bracteolae ovatae, acutae, 2–3 mm. longae, membranaceae, carinatae. *Perianthium* circiter 1·5 mm. longum, segmentis 1 mm. longis elliptico-ovatis subacutis glabris. *Antherae* 0·5 mm. longae. *Stylus* circiter 1 mm. longus. *Fructus* turbinatus, 3 mm. longus, costis conspicuis et reticulationibus transversis instructus.

Nyasaland. Tanganyika plateau : Fort Hill, *Whyte*.

1093. **Thesium cinereum**, *A. W. Hill* [Santalaceae] ; species dense pilosa *T. lycopodioidi*, Gilg, et *T. striguloso*, Welw., similis sed pedunculis nudis axillaribus elongatis uti ramulis gracilibus, stylo brevi differt.

Herba vel suffrutex perennis, caudex ramosus, planta omnino dense cinereo-pilosa ; caules prostrati, cylindrici, sulcati, 15–30 cm. longi, ramulis floriferis axillaribus filiformibus dense obtecti. *Folia* subulata, acuta, 2–5 mm. longa, dorso pilosa. *Inflorescentia* 1–3-flora,

pedunculis ebracteatis axillaribus 2–8 mm. longis nonnunquam in ramulos foliosos filiformes e bracteolarum axillis productis. *Flores* involucro bracteolarum lineari-subulatarum cincti. *Perianthium* extus viride, dense pilosum, intus albidum, 2 mm. longum, segmentis 1–1·25 mm. longis margine membranaceis, prope basin pilosis marginibus et apicibus inflexis. *Antherae* circiter 0·5 mm. longae. *Stylus* 0·2 mm. longus. *Fructus* globoso-ovoideus, circiter 2 mm. diametro, dense hirsutus, costis et reticulationibus conspicuis.

Angola. Malange District : near Saba Onatunga in company with perennial *Leguminosae*, *Gossweiler*, 1115.

1094. **Thesium cymosum**, *A. W. Hill* [Santalaceae] ; species floribus plus minusve regulariter in dichasia dispositis et ramulis corymbosis distinguenda.

Herba perennis, compacta ; rhizoma repens horizontale; caules erecti, circiter 15 cm. alti, pauci, superne subdichotomi, multiramosi, quadrangulares, profunde sulcati, costis conspicuis. *Folia* basi squamiformia, superne anguste elliptica vel lineária, acuta, conspicue carinata, 5–6 mm. longa. *Flores* singuli vel in dichasia 3-flora dispositi ; pedunculi axillares, bracteis foliosis plus minusve adnati ; bracteolae 2, 2·5 mm. longae. *Perianthium* 2·5–3 mm longum, segmentis 2·25 mm. longis ovato-deltoideis cucullatis glabris vel margine minute ciliolatis. *Antherae* filamentis aequilongae, 0·75 mm. longae. *Stylus* 1·5–1·75 mm. longus. *Fructus* ovoideus ; circiter 2·5 mm. longus, costis 5 et reticulationibus conspicuis.

Nyasaland. Near the foot of Tshiradzura (Chiradzulu) mountain, *Kirk* ; Mount Zomba, *Buchanan*, 122 ; Chikala, 610 m., *Purves*, 25.

1095. **Thesium ephedroides**, *A. W. Hill* (Santalaceae] ; species ramulis multicostatis patulo-erectis rigidis, foliis lineari-elongatis acutis, floribus urceolatis distincta.

Suffrutex 25 cm. altus ; caulis erectus, superne ramosus, ramuli patule-erecti, rigidi, profunde sulcati, costis numerosis. *Folia* linearia, acuta, carinata circiter 1 cm. longa, coriacea, demum in bases induratas persistentes desinentia. *Flores* solitarii, in axillis bractearum foliosarum dispositi, breviter pedicellati ; bracteolae 2, 1·5 mm. longae. *Perianthium* urceolatum, 2·5 mm. longum, viride, segmentis 1·5 mm. longis triangulari-ovatis cucullatis paulo carnosis. *Antherae* filamentis aequilongae, 0·65 mm. longae. *Stylus* 1 mm. longus. *Fructus* albidus (fide *Range*), non visus.

German South West Africa. Kubub Mts., 1630 m. *Range*, 65.

1096. **Thesium fastigiatum**, *A. W. Hill.* [Santalaceae] ; affine *T. unyikensi*, Engl., praecipue caulibus et foliis minute puberulis differt.

Suffrutex perennis, omnino minute puberulus ; caudex lignosus, caulibus numerosis erectis, circiter 30 cm. altis sulcatis ramulis fastigiatis 3–5 cm. longis dense obtectis. *Folia* caulina ovata vel elliptico-lanceolata, apiculata, circiter 5 mm. longa, folia ramulorum subulata, acuta vel acuminata, circiter 2 mm. longa, dorso et ad margines minute puberula vel subglabra. *Flores* ad apices ramulorum ; bracteolae subulatae involucrum formantes. *Perianthium* 2·5 mm. longum, segmentis 1·25 mm. longis lineari-lanceolatis

cucullatis glabris marginibus inflexis. *Antherae* 0·5 mm. longae. *Stylus* 0·75 mm. longus. *Fructus* ovoideus, circiter 2 mm. longus, costis et reticulationibus conspicuis.

Portuguese East Africa. On a ridge at the back of Mendwe Chujala-yala, *Johnson*, 316.

Archdeacon Johnson states that the roots of this plant are used for fish traps.

1097. **Thesium fenarium**, *A. W. Hill* [Santalaceae]; species *T. nigricanti*, Rendle, affinis caulibus gracilibus foliis et floribus minoribus antheris majoribus praecipue differt.

Herba vel suffrutex perennis ; rhizoma gracile horizontale ; caules erecti, numerosi, 20–30 cm. vel ultra alti, graciles, ramosissimi, profunde sulcati. *Folia* prope basin ovato-lanceolata, subacuta, carinata, 3–5 mm. longa, superne linearia, acuta, patentia, 5 mm. longa. *Flores* pauci, singuli, vel in cymas axillares producti ; bracteae foliosae, partim pedunculis adnatae ; pedunculi plus minusve 5 mm. longi ; bracteolae 2, flores plus minusve aequantes. *Perianthium* 2·5 mm. longum, segmentis 0·75 mm. longis ovatis subacutis prope basin margine hirsutis. *Antherae* filamenta aequantes, 0·5 mm. longae. *Stylus* 0·75 mm. longus. *Fructus* ovoideus, 3 mm. longus, costis 5 primariis conspicuis, intermediis et reticulationibus inconspicuis.

Nyasaland. *Buchanan*, 1357 partim, 104 ; Mount Sotchi, *Scott Elliot*, 8541.

1098. **Thesium filipes**, *A. W. Hill* [Santalaceae] ; *T. Stuhlmannii*, Engl., affine ramis filiformibus elongatis parcissime ramosis, inflorescentiis paucifloribus differt.

Herba vel suffrutex annua (?), e rhizomate ramosa ; caules erecti, filiformes, tenaces, integri vel rarissime ramosi, 60–75 cm. alti, quadrangulares, sulcati. *Folia* minuta, squamiformia, distantia *Flores* axillares, 1–3 in spicam terminalen dispositi ; bracteolae numerosae, imbricatae, ovatae, acutae, carinatae, margine membranaceo-fimbriatae. *Perianthium* 2 mm. longum, segmentis 1·5–1·75 mm. longis linearibus acutis marginibus paulo inflexis hirsutis. *Antherae* filamentis 1 mm. longis, loculis 0·5 mm. longis. *Stylus* 1–1·5 mm. longus. *Fructus* non visus.

Tropical Africa. Congo : Dola, *R. Schlechter*, 12810.

A long wiry plant with flowers very similar to those of *T. Stuhlmannii*.

1099. **Thesium fimbriatum**, *A. W. Hill* [Santalaceae] ; affine *T. Stuhlmanii*, Engl., sed ramulis numerosis gracilioribus, bracteis ovatis acuminatis ciliatis, segmentis perianthii lineari-ellipticis differt.

Herba annua (?) ; caulis erectus, 22–30 cm. altus, superne dense ramosus, caule et ramis angulatis sulcatis ramulis gracilibus fastigiatis. *Folia* pauca, squamiformia, plus minusve compressa. *Inflorescentiae* ramulis foliosis axillaribus dispositae, plus minusve congestae ; bracteae et bracteolae 3–3·5 mm. longae, late ovatae, acuminatae, carinatae, marginibus fimbriatis vel ciliatis. *Perianthium* 3·5 mm. longum, segmentis 2·5 mm. longis lineari-ellipticis marginibus inflexis ciliatis. *Filamenta* 1·5 mm. longa, antherae

0·35–0·4 mm. longae. *Stylus* 2·5 mm. longus ; stigmate capitato *Fructus* globoso-ovoideus, circiter 1·5 mm. longus, costis 10 vel pluribus conspicuis.

Nyasaland. Between Kondowe and Karonga, 610–1830 m., *Whyte*, 321 partim.

1100. **Thesium fulvum**, *A. W. Hill* [Santalaceae] ; *T. cinereo*, A. W. Hill, simile sed habitu ramis paucioribus robustioribus foliisque ovatis distinguendum.

Suffrutex perennis (?), omnino pilosis fuscis obtectus, caules erecti, sulcati, 25–38 cm. alti, ramulis lateralibus 2–10 cm. longis. *Folia* plus minusve distantia, versus basin ovato-lanceolata, acuta vel subacuta, superne subulata, acuta vel acuminata, 2–1 mm. longa, dorso pilosa. *Flores* terminales pedunculo elongato nudo suffulti vel aliquanto in ramulis foliosis laterales, bracteolis circiter 1 mm. longis ovatis acuminatis pilosis involucrum formantibus. *Perianthium* 1·25 mm. longum, segmentis 0·75 mm. longis linearibus subacutis marginibus inflexis dorso pilosis. *Antherae* 0·35 mm. longae. *Stylus* circiter 1 mm. longus. *Fructus* globosus, pilosus, 1·5 mm. diametro, costis et reticulationibus conspicuis.

North Central Africa. Eastern Chari : Ndelli, *Chevalier*, 7672.

1101. **Thesium fuscum**, *A. W. Hill* [Santalaceae] ; species distincta caulibus cylindricis fuscis minute pilosis fructibus multi-costatis immaturis aurantiaco-brunneis.

Suffrutex, caulis erectus, superne multiramosus, circiter 30 cm. altus, cylindricus, minute pilosus, fuscus, rami paulo sulcati. *Folia* subulata, acuta, 1·75–2 mm. longa, dorso minute pilosa. *Flores* in inflorescentias axillares breves, bracteis et bracteolis imbricatis obtectis dispositi ; bracteolae late ovatae, acuminatae, 2 mm. longae, pilosae. *Perianthium* 3 mm. longum, extra hirsutum, segmentis 1·5 mm. longis elliptico-ovatis cucullatis glabris marginibus inflexis. *Antherae* filamenta aequantes, 0·65 mm. longae. *Stylus* 2–2·5 mm. longus. *Fructus* globoso-ovoideus, minute pilosus, immaturus, in sicco aurantiaco-brunneus, 2·5 mm. longus, 2 mm. latus, costis conspicuis 12 vel ob venas intercostales parallele dispositas pluribus.

Angola. *Gossweiler*, 4209, B (Herb. Mus. Brit.).

1102. **Thesium gracile**, *A. W. Hill* [Santalaceae] ; species *T. Schweinfurthii*, Engl., et *T. Goetzeano*, Engl., affinis sed foliis et bracteolis minoribus, floribus in cymas sympodiales dispositis praecipue differt.

Suffrutex, caules numerosi, erecti, superne ramosi, 12–30 cm. alti, rami elongati, foliosi, angulati et sulcati. *Folia* linearia vel linearilanceolata, acuta, 1–1·4 cm. longa, apice colore destituta. *Inflorescentia* sympodiali-cymosa, axillaris, ramosa, compacta ; bracteae ellipticae, vel lanceolato-subulatae, acutae, carinatae, plus minusve pedunculis adnatae ; bracteolae 2, floribus breviores. *Perianthium* albidum vel pallide luteum, circiter 1·75 mm. longum, segmentis 1 mm. longis ovato-deltoideis cucullatis marginibus inflexis apice barbatis. *Antherae* filamentis aequilongae, vix 0·25 mm. longae. *Stylus* 0·25 mm. longus ; stigmate dilatato. *Fructus* globoso-ovoideus, circiter 2 mm. diametro, costis conspicuis.

Rhodesia. Sebakwe, 1220 m., *Eyles*, 85. Portuguese East Africa. Gazaland: Umswirizwi flats, 335 m., *Swynnerton*, 310; Mozambique. Zonoe Manica, 760 m., *Johnson*, 255.

1103. **Thesium longirostre,** *Schlechter* MS. in Herb. Berol. [Santalaceae]; species caulibus et foliis papilloso-pilosis floribus et fructibus grandibus distincta.

Suffrutex rhizomate crasso; caules numerosi, plus minusve erecti vel prostrati, superne ramosi, 20–30 cm. longi, profunde sulcati, costis acutis papilloso-pilosis. *Folia* lineari-lanceolata, circiter 1 cm. longa, acuta, carinata, marginibus membranaceis et carina dense papilloso-pilosis. *Flores* sessiles, solitarii, in axillis bractearum dispositi; bracteolae 2, circiter 4 mm. longae. *Perianthium* cylindricum, 5·5 mm. longum, segmentis 3·5 mm. longis lanceolatis acutis cucullatis apice barbatis, margine membranaceo papilloso. *Antherae* 1 mm. longae; filamentis 0·75 mm. longis. *Stylus* 2 mm. longus. *Fructus* ovoideus, 3·5 mm. longus, glaber, costis 10 distinctis instructus.

German South-West Africa. Auas mountains, *Dinter*, 1504.

1104. **Thesium masukense,** *Baker* [Santalaceae]; *T. Stuhlmannii*, Engl., in habitu simile perianthio minuto praecipue differt.

Annuum (?), caules graciles, erecti, glabri, sulcati, inferne paulo alati, circiter 30 cm. alti. *Folia* squamiformia, subulata, acuta, carinata, circiter 1 mm. longa. *Flores* in spicas axillares compressas vel in spicas terminales dispositi; bracteae et bracteolae circiter 2 mm. longae, anguste ovatae, acutae, carinatae, marginibus membranaceis. *Perianthium* circiter 1·25 mm. longum, segmentis 0·75 mm. longis ovatis subacutis cucullatis glabris. *Antherae* 0·2 mm. longae. *Stylus* 0·5 mm. longus. *Fructus* globosus, circiter 1·5 mm. in diametro, costis et reticulationibus conspicuis.

Nyasaland. Masuku plateau, 1980–2140 m., *Whyte*.

1105. **Thesium mukense,** *A. W. Hill* [Santalaceae]; species *T. gracili*, A. W. Hill, affinis sed foliis numerosis elongatis, perianthio et antheris majoribus differt.

Suffrutex 15–50 cm. altus; caules numerosi, erecti, robusti, ramosi; rami adscendentes, 10–18 cm. alti, profunde sulcati. *Folia* numerosa, caduca, in partibus vetustioribus, 1·5–2·5 mm. longa, linearia, acuta, plus minusve erecta. *Inflorescentiae* pauciflorae, racemos terminales breves formantes. *Flores* in axillis bractearum dispositae, pedicellis bracteis ex parte adnatis; bracteae foliosae, 4–6 mm. longae, bracteolae 2, florem aequantes, vel eo breviores. *Perianthium* 2–2·5 mm. longum, urceolatum, segmentis 1–1·5 mm. longis ovato-deltoideis subacutis cucullatis apice et ad margines versus apicem dense barbatis. *Antherae* filamentis aequilongae, 0·5 mm. longae, antherae subpendulosae. *Stylus* 0·5 mm. longus. *Fructus* ignotus.

British East Africa. Muka, *Kässner*, 943; Ukamba, 1525–1830 m., *Scott Elliot*, 6407. Nyasaland. *Buchanan*, 45.

1106. **Thesium myriocladum,** *Baker* [Santalaceae]; species *T. doloensi*, Pilger, in siccitate nigricanti similis sed pedunculis brevibus foliis et bracteis anguste subulatis glabris acuminatis praecipue differt.

Suffrutex in siccitate nigricans; caules lignosi, rigidi, multiramosi, ramulis brevibus patentibus numerosis 2–6 mm. longis instructi. *Folia* lanceolata, subulata, 1·5 mm. longa, squamiformia. *Flores* solitarii, ad apices pedunculorum foliosorum dispositi; bracteis et bracteolis lineari-lanceolatis acuminatis circiter 1 mm. longis involucrum formantibus marginibus minute ciliolatis. *Perianthium* 2 mm. longum, segmentis ovato-lanceolatis 1·25 mm. longis glabris cucullatis marginibus inflexis. *Antherae* 0·5 mm. longae. *Stylus* 1·25 mm. longus. *Fructus* ignotus.

Rhodesia. Batoka highlands, *Kirk*.

1107. **Thesium palliolatum**, *A. W. Hill* [Santalaceae]; species *T. mukensi*, A. W. Hill, affinis sed cucullo elongato dense barbato segmentis perianthii et antheris minutis distinguenda.

Suffrutex vel herba, circiter 20 cm. alta, superne leviter ramosa; caulis profunde sulcatus, laxus. *Folia* linearia, carinata, 0·8–1·2 cm. longa, acuta. *Flores* brevi-pedunculata, singuli vel in cymas 3-floras dipositi, inflorescentias laxas terminales formantes; bracteae lineares, concavae, acutae, 8 mm. longae, pedunculis circiter 4 mm. adnatae, bracteolae 2, 2·5 mm. longae. *Perianthium* 2·5 mm. longum, campanulatum, segmentis 1·5 mm. longis apice cucullo circiter 0·5 mm. longo basi dense barbato instructis. *Filamenta* 0·4 mm. longa; antherae 0·25 mm. longae. *Stylus* 0·75 mm. longus. *Fructus* globosus, 1·5 mm. diametro, costis distinctis reticulationibus tenuibus instructus.

Portuguese East Africa. Lower Zambesi: Sena, *Kirk*.

1108. **Thesium pilosum**, *A. W. Hill* [Santalaceae]; species *T. lycopodioidi*, Gilg, et *T. striguloso*, Welw., affinis sed foliis floribusque majoribus antheris longis differt.

Suffrutex perennis, humilis, rhizomate lignoso; caules erecti, simplices vel prope basin ramosi, 6–10 cm. alti, dense pilosi. *Folia* triangulari-ovata, acuminata, 4–5 mm. longa, dorso et ad margines pilosa, paulo amplexicaulia. *Flores* subsessiles vel breviter pedunculati, axillares; bracteolae lineari-lanceolatae, acuminatae, 3 mm. longae, involucrum formantes. *Perianthium* 2·5 mm. longum, extra hirsutum, segmentis circiter 1·75 mm. longis anguste ovato-lanceolatis cucullatis marginibus membranaceis paulo inflexis. *Filamenta* 0·5 mm. longa; antherae 0·75 mm. longae. *Stylus* 2 mm. longus. *Fructus* immaturus.

Angola. *Gossweiler*, 4209 C (Herb. Mus. Brit.).

1109. **Thesium resedoides**, *A. W. Hill* [Santalaceae]; species distincta speciebus segmentis perianthii barbatis affinis, floribus subsessilibus in spicas terminales vel in cymas 3-floras dispositis.

Suffrutex perennis, humilis; caudex lignosus; caules erecti, 15–20 cm. alti, ramis patentibus 5–10 cm. longis angulatis sulcatis. *Folia* distantia, patentia, 6–8 mm. longa, subulata, acuta, apice decolorata. *Inflorescentia* spicata vel racemosa, floribus singulis subsessilibus vel in cymas 3-floras dispositis; bracteae lanceolatae, acutae, floribus aequilongae vel longiores, saepius pedunculo adnatae; bracteolae 2, floribus breviores. *Perianthium* album, circiter 2·5 mm. longum, segmentis elliptico-ovatis obtusis 1·5 mm. longis cucullatis marginibus versus apicem dense barbatis. *Filamenta* 0·4 mm. longa; antherae 0·65 mm. longae, dorso dense hirsutae. *Stylus* 0·75 mm.

longus. *Fructus* ovoideus 3 mm. longus, 2 mm. latus, immaturus, costis inconspicuis. *Thesium Welwitschii*, Baum in Kunene-Zambesi Expedition, p. 230, non Hiern, Welw. Cat. Afr. Pl. Pt. iv. p. 938.

Angola. By the river Chitanda, on sandy ground between quartz rocks, *Baum*, 152.

1110. **Thesium tamariscinum**, *A. W. Hill* [Santalaceae]; inter species involucro bracteolarum instructas ramulis tamarisciformibus tenuibus foliis reductis distincta.

Suffrutex perennis (?), caules prostrati vel suberecti, 10–50 cm. longi, sulcati, multiramosi; rami glabri, flexuosi, tenues vel filiformes. *Folia* squamiformia, ovata, acuta, plus minusve 1 mm. longa, distantia. *Flores* singuli, ad apices ramulorum breviorum foliosorum 0·5–3 mm. longorum dispositi; bracteolae circiter 0·75 mm. longae, ovatae, acutae vel acuminatae, involucrum parvum formantes. *Perianthium* 1·5 mm. longum, segmentis 1 mm. longis anguste ovatis cucullatis marginibus superne inflexis ad basin minute ciliolatis. *Antherae* filamentis aequilongae, 0·25 mm. longae. *Stylus* 1 mm. longus; stigmate capitato. *Fructus* globoso-ovoideus, circiter 2 mm. longus, costis primariis et reticulationibus distinctis instructus.

Nyasaland. Between Kondowe and Karonga, 610–1830 m., *Whyte*; Nyika plateau, 1830–2135 m., *Whyte*, 168.

XXVIII.—THE HONGKONG HERBARIUM.

S. T. Dunn.

The herbarium, library, and offices of the Botanical and Forestry Department of the Hongkong Government are contained in a charmingly situated building overlooking the Botanic Gardens and the harbour. The library and herbarium are accommodated in a fine room which occupies about half the ground floor, and is well lighted during the day by six large windows opening to the ground and by electric light at night.

Owing to the expense and difficulty of preserving books and dried plants in that climate, the range of literature is confined to subjects absolutely necessary to the work of the department, and the plant collections represent only the flora of China and contiguous countries, and such species as have been cultivated locally. As in other herbaria in the tropics, the two enemies, damp and insects, have to be combated without intermission, the former by artificial drying, the latter by poisoning the specimens with corrosive sublimate. The room is dried at night during the prevalence of the hot moist conditions of the south-west monsoon by means of a large gas stove, and the whole collection is gone over once a year to ensure that no trace of mould or of insects is overlooked. The books are preserved from the attacks of cockroaches (which demolish the bindings of any not specially protected) by the application, every four or five years, of a special varnish.

The work entailed in these operations is done by two Chinese herbarium assistants, whose sole duty it is to prepare and preserve

the collections. The Chinese are eminently suited to such duties ; they like the work, and can soon be trained to handle specimens with care. In the present organization of the herbarium, the point aimed at is to ensure that these men take all the work, not requiring botanical knowledge, off the hands of the Superintendent and Assistant Superintendent, the only European officers of the department, whose time is chiefly devoted to higher executive duties. The principal difficulty in utilizing Chinese in this way lies in their inability to grasp our system of classification, or to become accustomed to the Latin names of plants. The latter difficulty is aggravated by the strangeness of the, to them, foreign handwriting in which these names are written, often hastily, on the labels. These troubles once overcome, the Chinaman becomes a very useful man in the herbarium, and the following plan has been devised to meet the case. All generic names are immediately translated by the assistants into numerals, and are, at least during the first years of training, spoken of and thought of in their numerical form. For this purpose the collection has been conspicuously numbered with large printed numbers ; each sheet and species cover has its number and the numerical contents of each shelf and each cabinet are indicated clearly on the outside. The numbers are, for flowering plants, those given to the natural orders and genera in Bentham and Hooker's *Genera Plantarum*. Each *Clematis* sheet, for example, is stamped 1–1 and each *Carex* 199–61. A printed alphabetical list of all the genera in the herbarium followed by their proper numbers, is pasted inside each cabinet door. The numbers of Cryptogamic genera follow on from the last numbers of the *Genera Plantarum*, and have been arranged in the same sequence as that adopted in Kew publications.

The assistants, having received a collection generically named, can by the above device number it, classify it and poison it. They can then match the specimens with the herbarium sheets, taking out, and submitting in batches for verification, the plants which they believe to be conspecific. When the correct name has thus been obtained they proceed to copy the labels, set aside duplicates, enter in the plant lists, and finally, if required, lay into the herbarium. The numerical system makes it possible for specimens required in other parts of the building to be quickly found and brought by the assistants, on quotation of the number, and it practically obviates all mistakes in the replacing of the plants in their right positions on being returned to the herbarium. The writer has also found it convenient, when making large collections in the interior, to carry a list of the genera and numbers so as to add the latter to the labels, which enables the Chinese driers to keep the dried plants in systematic order for reference.

The idea of forming a herbarium in connection with the public gardens, then a branch of the Surveyor General's department under the charge of Ford, was first referred to in the official report of the latter dated 31st December, 1872. During the 30 years, which had elapsed since the occupation of the island by the British, a considerable amount of collecting had been done, such well known botanists as Fortune, Hinds, Harland, Champion, and,

above all, Hance, having at various times explored the neighbourhood, but their collections had all been sent out of the colony. Hance, however, who was at that time British Vice-Consul at Whampoa, had his herbarium, the most important collection of Chinese plants then in existence, at his official residence on Dane's Island, some 80 miles from the British colony, and it was doubtless through making full use of his herbarium, library, and advice, that Ford was able in 1878 to report that a public herbarium was in process of formation in Hongkong. But if, in this sense, Ford's herbarium was the daughter of Hance's, it is equally certain that it soon attracted the attention of Kew, with which establishment it has been almost from the beginning in constant communication. The botanical development of the department received considerable official help through the good offices of Sir Joseph Hooker, then Director of the Royal Botanic Gardens, Kew, who in an official memorandum, dated Feb. 1st, 1878, described Hongkong as "the key to the botanical position as regards the Chinese Empire," and during the next few years the building up of the herbarium, now accommodated in more adequate quarters, was pushed forward with energy. The co-operation of Sampson, who still lived in Canton, and of other collectors was secured.

In 1882 the appointment of an English assistant enabled Ford to leave Hongkong on the first of a series of expeditions into the interior of China to investigate the flora and the vegetable economic products, which were up to that time practically unknown to the outside world, except as articles of commerce. This journey was taken at the instance of Sir Joseph Hooker to endeavour to trace the botanical origin of *Cassia Lignea*, one of the most important products of South China. Ford proceeded up the West River to the Kwangtung Cassia districts, and completed a very thorough piece of work to the satisfaction of the Government, who printed and circulated an account of the expedition and its economic results. The collection of wild plants made along the route was added to the herbarium. Another important contribution to our knowledge of Chinese commercial products was made about this time by Ford by the procuring from South Kwangtung and the successful cultivation of Star Anise. In 1883, in company with Faber, he made a botanical exploration of the Lo Fou Shan, 50 miles from Canton, and returned with considerable living and dried collections, containing several plants new to science.

Meanwhile the herbarium collection was being increased by the contributions of collectors from other parts of China, such as B. C. Henry from Hainan, Watters (and Ford) from Formosa, and Faber from Ningpo, while Ford and his assistant, Westland, made frequent short expeditions in the intervals of their more pressing work and discovered many new and interesting species in the neighbourhood of Hongkong. Among other things, Ford succeeded in determining the botanical origin of the important Fan Palm and of Chinese Ginger. In 1886, Chinese Botany suffered an irreparable loss by the death of Hance, and Ford not only found himself deprived of his constant help and advice, but also of the possibility of consulting his excellent herbarium and library, which were before long sold and removed to England.

In 1887 considerable collections were made on the North River and Lienchow River, and the herbarium, which was now assuming formidable proportions, was removed shortly afterwards (1892) into the larger premises which it now occupies. The 1887 expedition seems to have been the last until recent years made by the department, but collections from other sources continued to pour in. Bodinier and Bourne were among the chief contributors, but by far the most important collections were presented by A. Henry from Formosa, Szechuan and Yunnan, 3041 specimens in all. In 1899 the New Territories were taken over by the Colony, and the great extension of forestry work, which immediately fell on the department, precluded Ford from devoting much more time to the herbarium up to the date of his retirement in 1903.

When the writer took over the superintendence of the department in that year, there were, therefore, large accumulations of material awaiting examination and incorporation in the herbarium, and it became evident that some plan would have to be devised to cope with them. This was accomplished by the appointment at the commencement of the following year of the two herbarium assistants and the reorganization of the work referred to above.

During the last seven years the most important presentations to the herbarium have been a further set of Henry's Yunnan plants from Kew, Ningpo plants from Barchet, Szechuanese plants from Crosfield, and small collections made by Light in Hunan, and Matthew in Korea, Weihaiwei and Kwangtung. Large collections have been purchased from Wilson (W. China) and Forrest (Salwen Valley). The writer has added small collections, made during intervals of leave in Shantung, Korea and Formosa, while Tutcher (Assistant Superintendent) has continued his indefatigable and fruitful explorations of the flora of the Colony, adding year after year numerous novelties to its list.* Official expeditions have been made by native collectors to Hoifung (N.E. Kwangtung) and Sze-tse Shan (S.E. Kwangtung) while more elaborate explorations of Central Fokien and the Swatow Hinterland (Kwangtung) have been conducted by the writer. The Fokien expedition, of which an account was published in the journal of the Linnean Society, xxxviii. (1908) 350–73, was probably the most productive contribution yet made by the department to systematic botany, 5000 specimens being brought home, including types of 50 new species. Not only the Hongkong herbarium but several other large herbaria will eventually be well provided from this collection with material representing the flora of this little-explored province.

The principal economic additions to the collection during this last period have been the type specimens of all the Chinese plant products of which Hongkong is a market. Samples of each, bearing similar numbers, were sent to the Imperial Institute, where most of them may be seen in the Hongkong Court. This should obviate to some extent the frequent misunderstandings which occur when enquiries about Chinese products are made from Hongkong or from London, owing to the indefiniteness of the Chinese names.

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* *See* Tutcher in Journ. Linn. Soc. xxxvii. (1905) 58–70, and Dunn in Journ. of Bot. 1907–1909.

Owing to the great distance of Hongkong from Europe and America, there is not much evidence of the work of botanists outside the department on the herbarium sheets, but Dr. Hans Hallier has recently revised the *Convolvulaceae*, Col. Prain the Dalbergias, Copeland the Ferns, and Sir Joseph Hooker the Balsams. The large series of Balsams, bearing on nearly every sheet the drawings and handwriting of that veteran botanist, forms one of the principal ornaments of the collection.

Besides the journal of work done in the herbarium, a consecutively numbered list is kept of all plants added to the collection, not previously numbered; this includes all the plants collected by the staff, and their labels now invariably bear Hongkong Herbarium numbers and not personal ones. A record is also kept up to date in tabular form of the provincial distribution of each species of the Chinese flora, indications being inserted in their proper places as new provinces are added to the area of the species, on the evidence of specimens or of printed records. All such specimens are preserved in the herbarium, so that it probably contains, as indeed it ought to do, the most complete series of Chinese plants in existence.

XXIX.—DECADES KEWENSES.

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LVII.

561. **Micromeles caloneura**, *Stapf* [Rosaceae-Pomeae]; species nova ex affinitate *M. Schwerinii*, C. K. Schneid., foliis infra viridibus subglabris serratura minus inaequali et minus acuta, inflorescentia multo minus villosa, floribus majoribus, sepalis latis obtusis, stylis 5, fructibus majoribus distincta.

Arbor mediocris vel *frutex*; rami glabri, cortice subnitido nigro-castaneo obtecti, parce lenticellati, tandem transverse rugosi. *Gemmae* hibernantes ovoidei, extus glabri; perulae intus fulvo-pilosae et ex axillis pilis fulvis stipatae. *Folia* elliptico-oblonga vel obovato-oblonga, acuta vel rarius acuminata vel interdum obtusiuscula, basi subacuta, duplicato-serrato-crenata, crenis nervos laterales primarios recipientibus quam caeteris plerumque majoribus 6–9 cm. longa, 3–4·5 cm. lata, firme herbacea, decidua, supra glaberrima, demum saturate viridia, infra pallida, secundum nervos saltem ad eorum axillas parce villosula, nervis lateralibus subrectis eximie parallelis utrinque 10–12 supra eleganter impressis infra prominentibus, venis transversis areolisque tenuissimis; petioli 6 mm. longi, primo laxe pilosi, mox glabri, anguste canaliculati; stipulae subfiliformes, 6–8 mm. longae, pilosae, mox deciduae. *Flores* plerumque in ramis abbreviatis in corymbos multifloros dispositi 6 mm. diametro; ramuli et pedicelli et bracteae caducissimae, filiformes, laxe villosulae. *Receptaculum* turbinatum, pilosulum. *Sepala* late ovata, obtusa, vix 2 mm. longa, villosula. *Petala* alba, late obovata, 5 mm. longa; stamina circa 20; antherae violaceo-purpureae. *Styli* 5, inferne connata. *Fructus* globoso-pyriformis, brunneus, lenticellatus, 8–10 mm. longus.

China. Szechuan : Northern Wushan, *Henry*, 7027 ; in woods, at 2400 m. above sea-level, *Wilson*, 3496a.

This well marked species has recently flowered in the Coombe Wood nursery of Messrs. J. Veitch & Sons, on whose behalf seeds were collected in Western China by Mr. E. H. Wilson.

562. **Diospyros (Ermellinus) strigosa,** *Hemsl.* [Ebenaceae] ; species *D. erianthae*, Champ., proxima, differt imprimis foliis basi cordatis et venis primariis numerosioribus supra impressis.

Rami juniores pilis patentibus rufescentibus vestiti, internodiis circiter 1 cm. longis. *Folia* subdisticha, brevissime petiolata, vix coriacea, oblongo-lanceolata vel interdum ovato-lanceolata, raro obovato-oblonga, 5–10 cm. longa, 2–5 cm. lata, acuta, basi leviter cordata, rarius rotundata, nunquam cuneata, supra glabra vel cito glabrescentia, subtus ferrugineo-pubescentia, venis primariis lateralibus utrinque circiter 7 subtus elevatis. *Flores* tetrameri, 1–1·2 cm. longi, utriusque sexus similes, axillares, solitarii, brevissime pedunculati ; pedunculi calycesque bracteolis compluribus (circiter 6–8) sursum gradatim majoribus 1·5–6 mm. longis rigidis arctissime imbricatis cincti. *Calyx* densissime strigoso-setosus, fere ad basin 4-partitus ; segmenta lanceolata, circiter 6 mm. longa, corollae tubum fere aequantia et illi arcte appressa. *Corolla* hypocrateriformis, circiter 1 cm. longa, extus supra medium strigoso-setulosus, tubo apicem versus leviter constricto, lobis lanceolatis circiter 3 mm. longis. *Stamina* 12, inaequilonga, pistillodio filiformi. *Ovarium* strigilloso-pilosum, 4-loculare, loculis uniovulatis ; styli 2, breves. *Staminodia* nulla. *Fructus* nobis ignotus.

China. Hainan, *Henry*, 8741.

563. **Duvalia sulcata,** *N. E. Brown* [Asclepiadaceae-Stapelieae] ; affinis *D. Corderoyi*, N. E. Br., sed caulibus 4-angulatis et corollae lobis 5-sulcatis facile distinguitur.

Caules decumbentes, 2·5–6·5 cm. longi, 4-angulati, 1·2–1·8 cm. (absque dentibus) crassi, glabri, albido-virescentes, purpureo-variegati, dentibus 6–10 mm. longis subulatis integris. *Flores* 1–3, subfasciculati. *Pedicelli* 2–2·8 cm. longi, 1·5 mm. crassi, patentes, glabri. *Sepala* 3 mm. longa, ovato-lanceolata, acuta, glabra. *Corolla* circa 4·5 cm. diametro, brunneo-rubra, annulo pilis longis pallide roseis dense vestito ; lobi 1·6–1·8 cm. longi, 1·2 cm. lati, patentes, ovati, acuti, convexi (nec replicati), 5-sulcati, apice rugulosi, glabri, basi pilis longis clavatis purpureis vibratilibus ciliati ; annulus 1·2–1·4 cm. diametro, circularis. *Corona exterior* circularis, plana, annulo subinclusa, purpurascens, annulo lutescente prope marginem instructa, glabra. *Coronae interioris* lobi 2 mm. longi, erecti, ovoidei, acuti, apice leviter incurvati, albi.

Arabia. *Bent.*

Described from a living plant brought by the late Mr. Theodore Bent from South Arabia, which flowered at Kew in 1898 and 1899. Its nearest ally is *D. Corderoyi*, N. E. Br., a native of South Africa, from which it differs in its 4-angled, handsomely mottled stems, and in the corolla-lobes being merely convex, with 5 grooves on their inner face and not at all folded as in *D. Corderoyi*.

564. **Euphrasia Iinumae,** *Takeda* [Scrophulariaceae-Euphrasieae]; ab *E. insigni*, Wettst., cui remote affinis, differt caule humiliore ad medium ramoso, foliis basin versus minus attenuatis, dentibus

acutis nec acuminatis, longitudine latitudinem in maximo minus duplo superante, spica densiore, floribus minoribus.

Caulis erectus vel ascendens, firmus, 15–20 cm. altus, fuscescens, pilis albidis crispulis reversis pubescens, ad medium ramosus, ramis paucis erectis vel erecto-patentibus suboppositis interdum iterum ramosis. *Folia caulina* infima non vidi, media ovalia, obtusata, utrinque dentibus obtusiusculis 2–3 raro 4, basi cuneata, superiora rhombeo-ovalia, acuta, basin versus cuneato-attenuata, utrinque dentibus 2–3 raro 4 acutis et non acuminatis; folia omnia glaberrima in speciminibus siccatis brunneo-nigrescentia. *Bracteae* dense imbricatae, suboppositae vel alternatae, latitudine folia caulina superantes, cuneato-flabellatae vel rhombeo-ovales, basin versus attenuatae, utrinque dentibus 2–3 rarius 4 acutis sed non acuminatis. *Spica* modice longa, densa. *Flores* breviter pedicellati. *Calyx* dentibus tubum aequantibus lanceolatis acutis in nervis setulosis margine hirsutis, fructifer vix accretus. *Corolla* magna, in dorso circiter 8–9 mm. longa, tubo denique calycem paullo superante, labio superiore bilobo, lobis reflexis leviter emarginatis, labio inferiore dilatato trilobo, lobis emarginatis; corollae color verosimiliter albidus, labio superiore caerulescente, labio inferiore macula lutea picto (?, solum ex sicco), extus minute hirsuto. *Capsula* cuneata, circa 4·5–5 mm. longa, emarginata, calycem aequans vel brevior atque rarissime parum superans, margine pilis albidis paucis ciliata, ceterum glabra; seminibus in quoque loculo solum tribus.—*Euphrasia latifolia*, Iinuma, Sômoku Dzusetsu, xi, p. 67, non Pursh. Icon. *Iinuma, Sômoku Dzusetsu*, xi, r. 66 (*forma b.*).

Prostant formae duae: altera (a. *cuneata*, m.) foliis rhombeo-ovalibus basin versus valde cuneato-attenuatis, bracteis latioribus quam longis, calyce 4–4·5 mm. longo; altera (b. *latifolia*, m.) foliis late ovatis, bracteis cuneato-flabellatis, latitudine longitudinem superante, calyce 3·5–4 mm. longo.

Japan. Central Nippon: on Mt. Ibuki, prov. Ômi, *R. Yatabe*, 1. viii. 1881 (*forma b*); *T. Makino*, x. 1905 (*formae a* et *b*).

This species is named in compliment to Yokusai Iinuma, the author of the famous Sômoku Dzusetsu, who described in his works one of the Japanese species of *Euphrasia* for the first time.

565. **Euphrasia idzuensis**, *Takeda* [Scrophulariaceae-Euphrasieae]; statura *E. multifoliae*, Wettst., similis, a qua foliis ovatis nec elliptico-lanceolatis, floribus majoribus, calyce post anthesin accreto, capsula non multo breviore facile distinguitur.

Caulis erectus, firmus, 15–45 cm. (vulgo circa 25 cm.) altus, nigro-fuscescens, pilis albidis crispulis reversis eglandulosis pubescens, ad et supra medium ramosus, in parte inferiore foliis deciduis mox denudatus, ramis erecto-patentibus vel suberectis oppositis numerosis, saepius hinc inde iterum ramosis. *Folia caulina* infima cuneiformia vel ovato-cuneata, obtusa, utrinque dentibus 1–2 obtusis, inferiora ovata, basi cuneata vel subrotundata, utrinque dentibus 3 obtusis, media late ovata, acutiuscula, basi rotundata, utrinque dentibus 3–5 acutiusculis, si dentes 5 adsunt dente infimo minimo, superiora ovata, acuta, basi cuneata, interdum subrotundata, utrinque dentibus 3–4 acutis acutissimisve; folia omnia opposita, glabra, margine solum setulosa, in speciminibus siccatis atroviridia. *Bracteae* foliis caulinis similes, ovales vel rhombeo-ovales, acutae, utrinque dentibus

tribus acutissimis sed non aristatis. *Spica* pro ramorum longitudinis ratione brevis. *Flores* magni, subsessiles. *Calyx* dentibus tubum aequantibus lanceolatis acutis, in nervis et margine setulosis, post anthesin modice accretus. *Corolla* in dorso 7–8 mm. interdum fere 9 mm. longa, tubo calycem paulo superante, labio superiore bilobo, lobis reflexis plus minusve emarginatis interdum subintegris, labio inferiore late trilobo, lobis emarginatis, tota alba, labio superiore striis purpureis extus apiceque hirsuto, labio inferiore maculis luteis picto in medio hirsuto. *Capsula* cuneata, ad 5 mm. longa, emarginata, calycem subaequans, margine pilis albidis longe ciliata, ceterum glabra, seminibus in quoque loculo 5–6.

JAPAN. Central Nippon: Prov. Idzu; Karuizawatôge, *H. Takeda*, 13 . x. 1900; Shuzenji, *T. Yamanaka*, 28. viii. 1905; Iwatoyama, *H. Takeda*, 12 . x. 1905.

This species has been collected only in the province of Idzu. The first specimens, which I found in 1900 on the pass Karuizawatôge between Atami and Däiba, induced me to study the species of this genus. The flower of my plant is pure white in colour with a yellow mark in the centre, and small spots of the same colour at the base of the lower lip, the upper lip having stripes of purple colour.

566. **Euphrasia Makinoi**, *Takeda* [Scrophulariaceae-Euphrasieae]; a *E. idzuensi*, Takeda, cui arcte affinis, bracteis late ovatis nec cuneato-ovatis, calyce et capsula angustiore pauloque longiore, seminibus paucioribus, floribus minoribus dignoscitur.

Caulis ascendens vel erectus, 17–28 cm. altus, brunneo-fuscescens, pilis albidis crispulis reversis eglandulosis pubescens, ad medium ramosus, in parte inferiore foliis deciduis mox denudatus, ramis erecto-patentibus curvatis (an semper?) oppositis. *Folia caulina* inferiora mihi ignota, media et superiora ovata, acuta, basi rotundato-cuneata vel cuneata, utrinque dentibus 3–4 acutissimis sed non aristatis; folia omnia opposita, glabra, margine solum setulosa, in sicco nigrescenti-viridia. *Bracteae* late ovatae, acutae, basi rotundatae, utrinque dentibus tribus acuminatis sed non aristatis. *Spica* modice longa, laxiuscula. *Flores* parvi, breviter pedicellati. *Calyx* dentibus tubum aequantibus oblongo-lanceolatis acuminatis in nervis margineque setulosis, post anthesin paululum accretus. *Corolla* in dorso 7 mm. longa, tubo calycem fere aequante, labio superiore bilobo extus hirsuto, lobis reflexis emarginatis, labio inferiore trilobo lobis emarginatis; corollae color ex sicco albidus. *Capsula* anguste cuneata, circiter 5·5 mm. longa, leviter emarginata, calyce paulo brevior, margine pilis albidis ciliata, ceterum glabra, seminibus in quoque loculo 4.—*Euphrasia officinalis* var. *vulgaris*, Makino, in Tôkyô Bot. Mag. x (1896), p. 108, pro parte, non Benth.

JAPAN. Shikoku: Prov. Tosa, *T. Makino*, ix. 1891.

567. **Utricularia Cavalerii**, *Stapf* [Lentibulariaceae]; affinis *U. racemosae*, Wall., a cuius formis tenuibus differt bracteis obtusiusculis multo minus descendentibus, capsula ellipsoideo-globosa vel ellipsoidea et imprimis seminibus eximie spinuloso-muricatis.

Herba tenuis, 8–15 cm. alta. *Caules* cum foliorum rosulis e rhizomate tenuissimo applanato orti, filiformes, simplices, exsiccando nigricantes, ima basi stolones et rhizoidea laevia tenuia edentes. *Folia* rosularum pauca, spathulata, sensim in petiolum attenuata et eo incluso ad 4 vel 5 mm. longa, obtusa; caulina 2–3, squamiformia,

subdeltoidea, medio vel sub medio affixa, utrinque vel basi saltem obtusa, circiter 1 mm. longa, hyalina. *Utriculi* e stolonibus rhizoideis vel foliis orti, stipitati, globosi, 0·5–0·75 mm. diametro, labio superiore glanduloso-fimbriato lato. *Bracteae* foliis caulinis similes, nisi magis oblongae, circiter 1·5 mm. longae ; bracteolae subulatae, 1 mm. vel ultra longae ; pedicelli 1–1·75 mm. longi, tenues. *Calyx* labiis late ovatis obtusis, inferiore majore sub anthesi ad 2 mm. longo saepe emarginato. *Corolla* violacea ; labium superum anguste oblongum, vix 2 mm. longum, erectum ; labium inferum ore ascendente late subquadratum, emarginatum, ad 3 mm. longum ; calcar fere rectum, descendens, subobtusum, 4 mm. longum, subinflatum. *Staminum* filamenta linearia. *Stylus* distinctus, ultra 0·5 mm. longus. *Capsula* ellipsoidea vel ellipsoidea-globosa, 2·5 mm. longa, e calyce paululo exserta. *Semina* ellipsoidea, 0·25 mm. longa, eximie spinuloso-muriculata, spinulis obtusis magis minusve seriatim dispositis.

Central China. Kwei Chou : Pin-fa, *Cavalerie*, 811 (comm. A. Léveillé).

568. **Tabebuia stenocalyx**, *Sprague et Stapf* (Bignoniaceae-Tecomeae] ; species insignis calyce angusto, corollae tubo gracili ad $\frac{2}{3}$ cylindrico, ovulis in utroque loculo biseriatis.

Arbor procerior ; ramuli novelli compressi, lepidoti, citissime glabrati, crebre lenticellati, vetustiores teretes, robusti cortice pallido obtecti. *Folia* elliptica, apice obtusissima vel rotundata, saepe leviter retusa, basi subacuta, 10–15 cm. longa, 7–10 cm. lata, coriacea, margine anguste recurva, costa subtus acute prominente, nervis lateralibus utrinque circiter 7 intermediis 1·7–2·5 cm. distantibus infra marginem arcuatim connexis reticulatione utrinque prominente ; petioli robusti, 1–1·7 cm. longi, supra ad junctionem cum lamina glandula oblonga notati. *Inflorescentia* paniculata ramis plerisque bifloris rhachi ramisque compressis superne tenuiter lepidotis ; bracteae foliaceae, oblanceolatae vel sublineares, vel summae subulatae inferiores 1·5–3 cm. longae, 2·5–7 mm. latae ; bracteolae e basi latiore magis minusve subulatae, ad 2 mm. longae ; pedicelli 1–1·7 cm. longae. *Calyx* tubulosus, superne sensim dilatatus, dense lepidotus, superne immerso-glandulosus, 2–2·5 cm. longus, ad os 0·5–0·7 cm. latus, irregulariter 2–3-dentatus, uno latere ad 5–9 mm. fissus, dentibus latis obtusiusculis. *Corolla* alba, extus glabra ; tubus 5–5·5 cm. longus, ad $\frac{2}{3}$ cylindricus 2–3 mm. latus, abhinc dilatatus ad os ad 12 mm. latus, intus supra stamina vittis papilloso-pubescentibus ad limbi sinus ascendentibus notatus ; lobi late ovati, obtusi, ad 2 cm. longi, fere ad 1·5 cm. lati, supra papillosi. *Stamina* circiter 18 mm. sub ore inserta, filamentis subaequalibus, 7·5 mm. longis ; staminodium 3·5 mm. longum. *Discus* cupularis, crenulatus. *Ovarium* tenuiter lepidotum ; ovula in utroque latere dissepimenti biseriata, ultra 30 pro serie, oblonga, horizontaliter affixa. *Fructus* ignotus.

Trinidad. Government House Grounds, *Broadway*, 2888.

A very distinct species which differs from those previously described in having only two rows of ovules in each cell. It may possibly represent a new genus, but until fruits are known it seems best to place it in *Tabebuia*.

There are specimens of an allied species in the Kew Herbarium from " Brazil, Hort. Kew " (Herb. Hook.), and from the Pomeroon

District of British Guiana, collected by im Thurn. This differs in the proportionately narrower leaves, cuneate at the base, and with more numerous lateral nerves.

569. **Gamogyne pulchra**, *N. E. Brown* [Aroideae-Philodendreae]; species nova affinis *G. Burbidgei*, N. E. Br., sed spatha kermesina, organis neutris (pistillodiis) basalibus, staminodiis nullis et stigmatibus rubris differt.

Herba perennis, acaulis, omnino glabra. *Foliorum* suberectorum petioli 5–9 cm. longi, teretes, faciebus canaliculati, basi breviter et late vaginati ; laminae 3–17 cm. longae, 2–3·7 cm. latae, lanceolatae, acutae, basi cuneato-acutae, supra virides, subtus pallidiores. *Pedunculi* erecti, circa 14 cm. longi, teretes, rufo-brunnei. *Spatha* subnutans, ellipsoidea, acuta, convoluta, apice tantum aperta, 4–4·5 cm. longa, 2 cm. diametro, pulchre kermesina. *Spadix* quam spatha fere duplo brevior, inclusus, cylindricus, obtusus, parte feminea quam mascula subduplo breviore rubra, basi organis neutris (ovariis abortivis) truncatis flavo-virentibus instructa ; parte mascula femineae contigua absque staminodiis, flavescente. *Ovaria* oblonga, truncata, stigmatibus sessilibus connata, 1-locularia, placentis brevibus duabus parietalibus basalibus. *Ovula* numerosa, erecta, suborthotropa, longe funiculata. *Antherae* oblongae, compressae, truncatae, apice biporosae.

Malay Peninsula. Johor : Gunong Pulai, in fissures of rocks in stream beds in dense forest, *H. N. Ridley*.

Described from a plant presented to Kew in 1905 which flowered in the Nepenthes House in March 1909.

570. **Catopsis penduliflora**, *C. H. Wright* [Bromeliaceae-Tillandsieae]; *C. sessiliflora*, Mez, proxima, foliis oblongo-ellipticis acuminatis floribusque pedicellatis pendulis differt.

Folia radicalia, rosulata, oblongo-elliptica, acuminata, 15 cm. longa, 3 cm. lata, supra viridia, nitida, subtus pallidiora, marginibus membranaceis denticulatis caducis ; nervi plures, tenues. *Scapus* 35 cm. altus, dimidio superiore racemose ramosus ; bracteae 1 cm. longae, herbaceae, lanceolato-subulatae, appressae ; rami 6 cm. longi, virides, tereti ; flores penduli ; pedicelli arcuati, 3 mm. longi ; bracteolae ovatae, 2 mm. longae. *Sepala* viridia, 3 mm. longa, aequalia, elliptica, obtusa, glabra. *Petala* alba, 8 mm. longa, 2·5 mm. lata, oblonga, apice rotundata. *Stamina* aequalia, petalis paullo breviora. *Ovarium* oblongum, obtuse trilobatum, 3 mm. longum, viride ; stylus albus, 8 mm. longus ; stigma trilobatum.

Peru. *Forget*.

Described from a living plant sent by Messrs. F. Sander & Sons, March, 1910.

XXX.—MISCELLANEOUS NOTES.

Mr. Arthur Brook Culham, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of Southern Nigeria.

Mr. C. VAN DER VOET, a member of the gardening staff of the Royal Botanic Gardens, has, we are informed, received an appointment in the Botanic Gardens, University of Michigan, Ann Arbor, U.S.A.

Presentations to Museums.—The following miscellaneous specimens have been received since those recorded in Bulletin No. 1 of the present year.

Right Honourable the Earl of Darnley, Cobham Hall, Kent.—Sections of timber of *Liriodendron tulipifera*, *Ulmus campestris*, *Fraxinus excelsior*, *Carpinus Betulus*, *Castanea sativa*, *Quercus pedunculata*, *Cedrus Deodara* and *Pinus Pinaster*.

Right Honourable the Earl of Wharncliffe, Wortley Hall, Sheffield.—Four sections from trunks of young sycamore trees and four sections from young oak trees. Four sections of wood of Corsican pine and a section of common birch with *Polyporus betuli* growing on same.

Mr. W. H. Johnson, F.L.S., Director of Agriculture, Companhia de Moçambique, Beira.—Several small sections of wood and samples of Cacao nibs from the Island of S. Thomé, also bag made with the seeds of *Leucaena glauca* by natives of Mozambique.

Director, Raffles Museum and Library, Singapore.—Plaster cast of fruit of *Entada spiralis*.

Mr. W. Klemme, Bureau of Forestry, Manila.—Section of "Mancono" wood (*Xanthostemon Verdugonianus*). This tree is found in abundance in north-eastern Mindanao, Philippine Islands, and the timber has been pronounced by the United States Naval Department as a satisfactory substitute for the wood of Lignum Vitae (*Guaiacum officinale*). *See* Kew Bulletin No. 3, 1909, p. 156.

Mr. Douglas Dering, H.M. Vice-Consul, Manaos, Brazil.—Fruits of *Leopoldinia Piassaba*, the palm furnishing Para Piassaba of commerce.

Mr. R. Tower, H.M. Minister, Mexico.—Specimens of wood of Lignum Nephriticum (*Eysenhardtia amorphoides*). *See* Kew Bulletin, No. 7, 1909, p. 293.

Mr. John Christie, of Messrs. Ide and Christie, Mark Lane, Loudon, E.C.—Photo-micrographs of Venetian Whisk (*Sorghum vulgare*), Mexican Whisk (*Epicampes macroura*), Kittool fibre (*Caryota urens*), fibre from stem of *Xanthorrhoea australis*, and of transverse sections of the rhizome of *Cymodocea antarctica*, a marine submerged plant used in Western Australia for brush-making. *See* Table Case, Room VII., Museum No. II.

Messrs. Sutton and Sons, Reading.—A collection of models of vegetables.

Dr. Emile Christ, Reunion.—Samples of Faham tea (*Angraecum fragrans*) and of Vanilla (*Vanilla planifolia*).

Messrs. Bibby and Sons, Liverpool.—Samples of Soy beans (*Glycine hispida*), imported into this country from Harbin and Sakura. Also a collection of 27 specimens of weed seeds.

Mr. James Kelly, Claremont.—Fruits of *Pterocarya caucasica* from a tree growing at Claremont, Esher.

Mr. A. King, White Rock, Hastings.—Hat-pins with heads formed of the fruit of the water chestnut (*Trapa natans*), also hat-pins, necklet and charm of Rhodesian mahogany seeds (*Afzelia quanzensis*).

Mr. S. T. Dunn, F.L.S., Superintendent, Botanic and Forestry Department, Hong Kong.—Chinese chair made of blackwood (*Dalbergia* sp. ?).

Mr. A. E. Evans, Botanical and Agricultural Department, Gold Coast.—Specimens of various economic products from Aburi and Tarkwa, including pods of Divi Divi (*Caesalpinia coriaria*), Soy beans (*Glycine hispida*), fruits of allspice (*Pimenta officinalis*), and of wild clove (*Pimenta acris*). Samples of rubber from the Para Rubber tree (*Hevea brasiliensis*). These samples have been submitted to Messrs. Lewis and Peat, Mincing Lane, London, E.C., who report upon them as being of excellent quality and equal in value to best plantation rubber.

Some well prepared rubber from the Lagos silk-rubber tree (*Funtumia elastica*) was also received, and a sample of camphor prepared from trees of *Cinnamomum Camphora* grown at Aburi. This latter sample was reported upon by Messrs. Bowyer and Bartleet, Fenchurch Street, London, E.C., under date March 4th last, as being of fair quality and of the value of about £6 per cwt., and comparing very favourably with China crude camphor.

J. M. H.

Sapium anadenum, *Pittier*, and **S. pleiostachys**, *Schum.* and *Pittier*.—In *Hooker's Icones Plantarum*, t. 2889, these proposed species were reduced to *S. jamaicense*, Swartz. Thereupon Mr. Pittier wrote questioning the correctness of this step, which was primarily taken in consequence of an error of his in identification. At that date Kew possessed no authenticated specimen of either *S. anadenum* or *S. pleiostachys*; but Mr. Pittier had referred Donnell-Smith's 2607, from Guatemala, to the latter. This number is represented at Kew, and is, as Mr. Pittier now admits, true *S. jamaicense*, so there was some justification for the assumption that the rest of the specimens he had under observation were conspecific with the Guatemalan plants. With regard to the reduction of *S. anadenum*, I was influenced by the fact that glands are sometimes present, as shewn in his photographic figure, and Pittier's own statement that it "might prove identical with *S. pleiostachys* on examination of more complete material," decided me.

However, through the courtesy of the Curators of the United States National Herbarium at Washington the original specimens of *S. anadenum* and *S. pleiostachys* have been sent to Kew for examination and comparison. The result is that I now think they may both be accepted as valid species, restricted, so far as present knowledge goes, to Costa Rica. Both differ from *S. jamaicense* in their leaves being borne on relatively long, slender petioles and in their less numerous, less conspicuous lateral veins; in their shorter,

clustered flower-spikes, and in floral details. From each other they differ in the following particulars :

Petiolar glands prominent ; midrib channelled above ; flower-spikes slender, equal in length	*S. pleiostachys.*
Petiolar glands obscure or absent ; midrib not channelled above ; flower-spikes stouter, unequal in length	*S. anadenum.*

The latter is one of the few species showing well-developed bracteoles subtending both male and female flowers.

W. B. H.

Pogonopus febrifugus, *Benth.*, var. **macrosema**, *Hutchinson*, var. nov. ; a typo sepalis petaloideis duplo majoribus differt.

Bolivia. La Paz Prov. : in woods near Pata, March, 1865, *Pearce !* Eastern Bolivia : in forests, *Gosling !* South Bolivia : Tarija Prov. ; San Luis, April, 1864, *Pearce !* Chuquisaca Prov., *Fiebrig*, 2705 ! Argentine Republic. Oran, July, 1873, *Lorentz* et *Hieronymus*, 384 !

Beautiful flowering specimens and samples of the bark of this plant were collected in the forests of the eastern provinces of Bolivia by Mr. Cecil Gosling, who has recently been on a journey in this region under the auspices of H.M. Government. He states that a decoction from the bark is there used as a substitute for quinine, and that this has the local reputation of being "better than any drugs obtainable from the chemist." The bark of the species has the same reputation and is known as "quina morada" ; a note on the alkaloid which has been separated from the bark was published in the *Pharmaceutical Journal* for March 30, 1889.

Chrysoxylon febrifugum (*Pogonopus febrifugus*, Benth.) was described by Weddell in 1849 (Hist. Nat. Quinq. p. 100) from a specimen collected by him in the province of Cordillera, Bolivia. This specimen consists of leaves and an infructescence only, and no flowers ; the leaves are very shortly petiolate and quite densely tomentose on the lower surface, whilst the infructescence is glabrate. In 1854, however, discovering that the name *Chrysoxylon* had already been used for another genus, he added an emended description, and a figure of the species under the name of *Howardia* (Ann. Sci. Nat. Ser. iv. vol. i. p. 65), and included a flowering specimen collected by him in 1846 in the province of Enquisivi. Owing to the kindness of Prof. Lecomte of the Paris Natural History Museum, we have been able to examine this plant and have found that the leaves are distinctly petiolate and merely pubescent on the lower surface and not subsessile and tomentose as in the type, whilst the inflorescence is tomentellous or almost tomentose. On account of these slight differences, therefore, we are rather doubtful whether Weddell was correct in considering these two specimens to represent the same species ; but, on the other hand, he may have made observations in the field which induced him to adopt this view.

When compared with Weddell's original specimen, unfortunately so imperfect, our plant might readily be considered to be specifically distinct, but if we accept his later conception of the species we must, in the absence of critical field notes, consider it to be only a variety.

J. H.

Micholitzia obcordata, *N. E. Br.*—When the genus *Micholitzia* was described in the *Kew Bull.*, 1909, p. 358, the exact locality in which Micholitz collected the plant on which the genus was founded was unknown. According to Messrs. Sander and Sons the plant was received from Micholitz probably along with *Dendrobium regium*.

In a collection made recently in various parts of India and Indo-China by Mr. A. Meebold, part of which was forwarded to Kew for determination, the writer found a specimen of *Micholitzia* which appears to be *M. obcordata*. The plant collected by Mr. Meebold agrees in the structure of its flowers with the type specimen of *M. obcordata* preserved in the Kew Herbarium but differs from it slightly in the shape of its leaves and the colour of its flowers. The notch at the apex of the leaves is, on the whole, much more pronounced, the leaves are slightly longer, and the corolla instead of being "olivaceo-virens" is bright yellow. It does not seem improbable, however, that these differences may be due to cultivation. Mr. Meebold collected his plant in Manipur, at Laimatak, at an elevation of 1,200 m. where it grew apparently as a parasite.

From the above information it seems probable that, of the two localities—India and Burma—suggested by Messrs. Sander for Micholitz's plant, the latter is the more correct.

W. G. C.

Botanical Magazine for July.—The plants figured are *Begonia Martiana*, Link et Otto, var. *grandiflora*, Garnier (t. 8322); *Iris Clarkei*, Baker (t. 8323); *Philadelphus Delavayi*, L. Henry, (t. 8324); *Aristolochia moupinensis*, Franch. (t. 8325); and *Rhododendron flavidum*, Franch. (t. 8326).

The *Begonia* is an attractive variety of a Mexican species, and has been in cultivation for the last twenty years. It is a tuber-bearing plant, and when well grown it has an erect stout stem 1½ ft. high, producing in profusion clusters of large rose-pink flowers. *Iris Clarkei* comes from Sikkim, where, at an elevation of about 10,000 ft., it was first discovered by Sir J. D. Hooker in 1848. The material for the figure was grown in the garden of Mr. W. R. Dykes, who has noted considerable variation in the form and coloration of the standards. It was first placed in the Pseudevansia group, but further investigation has shown that it is allied to *I. Delavayi*, Mich., a member of the Apogon group. *Philadelphus Delavayi* is one of the smaller-flowered species, a good grower, floriferous and fragrant. It was first introduced into Europe by the Abbé Delavay, who sent seeds from Yunnan in 1890; later, it was sent from the same region by Mr. E. H. Wilson when collecting for Messrs. James Veitch & Sons, who raised the plants

which provided the material for the figure. The *Aristolochia* is a hardy species, also obtained from Western China by Messrs. Veitch, and grown in their Coombe Wood nursery. Its flowers have a pale green tube 1 in. long, and a three-lobed spreading limb, 1¼ in. across, yellowish, with red markings. The *Rhodolendron* is a dwarf plant, with small leaves and rather small, very pale yellow flowers. Like the two preceding species mentioned in this note it was obtained from Western China, grown, and flowering specimens of it sent to Kew by Messrs. Veitch. Under the name of *R. primulinum*, Hemsl., it was described in the Gardeners' Chronicle, 1910, vol. xlvii., p. 4.

The Flora of the North-western States, Malay Peninsula.—Sir Joseph Hooker has forwarded to Kew a very interesting letter which he has received from Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore, on his recent journey to the States of Kedah, Perlis, and Setul, in the North-West of the Malay Peninsula. Mr. Ridley has kindly permitted us to publish it in the Bulletin.

Botanic Gardens, Singapore.
March 24, 1910.

DEAR SIR JOSEPH HOOKER,

I have just returned from a trip to the North-Western States, Kedah, Perlis and Setul, my object in going there being to find out where the Malay flora ended and the Siamese one began.

Many years ago I went to Gunong Terai (Kedah Peak) expecting to find traces at least of the Siamese flora, but it was all Malayan. This time I went first from Penang to Alor Star, the capital of Kedah. The country here is largely a flat plain with distant hills. These hills are of sandstone, while Kedah Peak (and a hill a little north of it, Gunong Peak I am told) is composed of granite like that of the main chain of the Malay Peninsula. Alor Star is mostly under rice cultivation, but I got to one sandstone hill with some forest on it and found that the flora was totally different from that of the Malay Peninsula further south. The rice-fields were very much dried up, but what of their flora I could get was again quite different from that of the flora of the rice-fields of Malacca, &c. Further north at Perlis and Setul it was even more marked. The absence of *Homalomena*, *Schismatoglottis*, *Calophyllum*, *Sonerila*, *Lipocarpha*, *Octhocharis*, *Oncosperma*, *Korthalsia*, *Argostemma*, *Urophyllum*, *Lasianthus*, *Orania*, *Arenga*, *Pinanga*, *Livistona*, *Fuirena glomerata*, most of the common *Cyperi*, *Spathoglottis plicata*, *Cyrtandra* and many other characteristic Malay plants was most marked, while such genera as *Garcinia*, *Adinandra*, *Castanopsis*, *Raphidophora*, *Quercus* were scantily represented, as well as *Hornstedtia*, *Ophiorrhiza*, *Anonaceae*. *Dipterocarpeae*, *Myrsineae*—all very scarce. On the other hand we had such plants as *Hapaline*, *Heterophragma*, *Adenophylla*, *Capparis*, *Exacum*, *Geissaspis*, *Smithia*, *Careya*, an increase in the number of *Desmodium*, a number of *Fimbristylis* new to me, *Albizzia*, *Acacia*, *Drosera*, *Osbeckia*, *Corypha*, an erect Bactris-like *Calamus*, *Thysanotus* and *Pachystoma*, besides an entirely different set of grasses, *Sterculia elata* and *S.? foetida*.

Dotted over the flat country of Perlis and Setul are large isolated hills of limestone looking like islands in the flat plain of heath and rice-field; and islands they have been not long ago according to the Malays; this too is shown by their containing caves full of sea-bird guano. These seabirds have long gone; one sees none even about the sea. Round these limestone hills run rivers, and pools of water lie at the base where the rivers are not, and at Setul the vegetation at the base consists of *Acrostichum aureum*, *Acanthus ebracteatus*, *Pandani*, *Barringtonia*, tidal *Ficus*. It is clear that this land is of modern formation and that the south of the peninsula, from near Kedah Peak southwards, was cut off from the Siamese States by sea. Kedah Peak I have reason to believe itself was an island at one time. A big chain of limestone hills rising to 2,000 feet runs from the north to the sea at Perlis, dividing Setul from Perlis. These limestone hills have a very homogeneous flora of which *Cycas siamensis*, *Impatiens mirabile*, *Dracaena cordylinoides*, *Adiantum—gomphophyllum* I think, *Euphorbia trigona*, *Hapaline*, *Amorphophallus haematospadix* and *A. carnea*, *Calanthe rubens*, *Eulophia Keithii*, *Chirita Viola* are characteristic. We found another balsam, but only two plants in flower, one with one flower only. It is very succulent, and when we tried to bring it home alive, dried up like a straw. It has large flowers of the coalscuttle shape, white with blue on the lip, much like the plant from Lenggong limestone hills, if not the same. *Impatiens mirabile* was common in places, its stems sometimes 6 inches through, of the quaintest shapes. It was here and there coming into flower and I saw one branched raceme, but most were out of flower. *Cycas siamensis* is very odd-looking. It grows on the highest precipices, hanging down and looking like some extraordinary snake. At Setul are some heaths, dry and sandy, with trees reduced largely to bushes, perhaps from fires. A dwarf bamboo is very common, and here we got the pretty pink *Habenaria Downii*, *Pachystoma* with violet-pink petals and a yellow lip, many *Commelinaceae*, *Drosera Burmanni*, *D. indica* and a *Thysanotus*, apparently not the Hongkong one as the leaves are terete and the petals prettily fringed. Three species of low shrublets (*Apocynaceae*) with pure white flowers, after the style of Oleander, are abundant and a very pretty dwarf shrub mallow with large crimson red flowers, an *Osbeckia*, *Stylidium* (the one we get at Malacca), many *Limnophilae* and *Fimbristylis*. In damper spots are small forests of *Melaleuca Leucadendron* fringing the outer edge of the tidal flora. This is undoubtedly wild here. Of course we know of similar woods in Malacca but there has been a story that the plant was introduced by the Dutch and only occurs round Dutch settlements. It is quite clear now that the tree is really indigenous.

We got many other plants which are quite new to me and are not at all like anything Malayan but look Indian.

The prevalence of thorny plants, *Acacia*, *Albizzia*, *Gardenia*, *Canthium*, *Quisqualis*, *Capparis* was as characteristic of the drier parts, especially the edges of the limestone hills at the base and the sandy spots, as it was troublesome to get through. In the rice-fields the characteristic tree was *Dolichandrone Rheedii*, usually a tidal-swamp bushy low tree, but it was dotted over the rice-fields in the form of a tall, erect-branched tree, with scanty leaves, and

looking like a disorganized poplar about 50 or 60 feet tall. Its fragrant flowers open after dark and fall before 7 a.m.

The Lankawi islands whence Curtis brought so many fine things are obviously a continuation of this main mass of limestone hills and their flora is also not Malayan and very similar. The seas off Setul and Perlis are very shallow and obviously silting up, and in time I should think the Lankawi islands would be standing in a silt plain like that surrounding the limestone hills of Perlis and Setul.

The Malayan flora then ceases about Gunong Terai. North of that is Siamese flora. It should be mentioned too that there is not only a distinct change of rock from granite to sandstone and limestone but of climate also, as there is a more distinct dry season north of Penang, both of which factors have undoubtedly an influence on the flora.

This is a long letter, but I thought you would like to have details of this curious change of flora. I have not yet begun to work out the collections, which are pretty big, so that there will be many more Indo-Siamese things to record. The season had been very dry, and many things perhaps had quite disappeared, which in the wet season we should have got.

By the way I never saw anything like the *Haemaria discolor* on some of the limestone rocks. We crept through a tunnel in one of the hills and found ourselves in a large circular space surrounded by lofty precipitous walls, and on the sides and fallen slabs of rock the *Haemaria* formed dense mats many feet across. The whole place was red with it.

* * * * * *

HENRY N. RIDLEY.

Jequié Maniçobas.—In the *Kew Bulletin*, 1908, pp. 59–68, an account was given of the three new species of *Manihot* from Bahia discovered and described by Dr. Ule. In the course of the same year a large quantity of the seeds of two of these species, *M. dichotoma* and *M. piauhyensis*, was obtained from Brazil and distributed to botanical and agricultural stations in the tropics (*K.B.*, 1908, p. 451). Several reports have been received as to the germination of the seed. In nearly every case the percentage of germination of the seeds of *M. dichotoma* was fairly high, but the results with *M. piauhyensis* were not so favourable, except apparently in the case of the seeds sown in the Botanic Station, St. Lucia, W. Indies, where the seeds were slightly filed near the hilum and about 25 per cent. germinated (St. Lucia, Botanic Station Report, 1908–09, p. 4). From Borneo we were informed at the beginning of this year that plants raised from the seed sent in 1908 and sown early in December were planted out when about 10 in. high; at the time of writing (Jan. 1910) the trees of *M. dichotoma* were 5 ft. high, some having a girth of 4 in. The young plants of *M. piauhyensis*, though not so tall are stated to be larger in girth.

Some interesting information as to the growth of the new Manihots in Ceylon has been given in the *Tropical Agriculturist* for May and November, 1909. The plants sent out in May, 1907

(*K.B.*, 1908, p. 61), were planted 20 × 20 feet apart on level ground in October, 1907. The twelve largest plants averaged 3 in. in girth, 3 feet from the ground, in May, 1908, and 6–7 in. in November, 1908. It is stated that months ago, before April, 1909—the time of writing—these trees had begun to produce seed. No tapping experiments had been made, but a drop of the latex is stated to appear to be decidedly rich in rubber (Trop. Agric. xxxii, May, 1909, p. 411).

A good illustration of the young trees in the experiment station at Peradeniya accompanies the article. In November the previous account was supplemented by a further article on *Manihot dichotoma* (Trop. Agric. xxxiii. Nov. 1910 p. 385) which occupied a three-acre plot at the experiment station. The average girth of the 98 trees on the plantation was at the time of writing 9 in. at 3 ft. from the ground. The 14 largest trees, however, showed an average circumference of 14 in. A second plot planted in November, 1908, 12 × 12 ft. apart, had at the end of the first year a girth of 6 in. and were "already producing seed in considerable quantity." The land on which these trees were grown was kept cultivated and this treatment appears to have been beneficial. The plants of *M. dichotoma* raised from seed are said to be extremely variable in vegetative characters, especially as regards leaf shape and also the capsules. On some trees the capsules are smooth—like those of *M. Glaziovii* but larger—whilst on others they bear high crinkled ridges or wings. It appears that the trees which resemble Ceara as regards leaves usually differ widely in respect of the capsules and *vice versâ*, but there is said to be no difficulty as to confusing the two species.

The winged capsules of this species are well shown in the figures in *Hooker's Icones Plantarum*, vol. xxix, tt. 2876, 2877, which were prepared from material sent to Kew by Mr. J. A. Davy, Riberião Preto, São Paulo, Brazil.

The variability exhibited by the trees suggests that the rubber yield may also be variable and indications to this effect have been noticed in Ceylon. Although the twelve trees tapped were only 2 years old and the rubber yield was small, "more than ten times as much rubber was yielded by the best as by the poorest yielder." Care should be taken therefore to insure that seeds or cuttings should be used from those trees only whose yield of rubber is high and this caution is doubtless equally applicable to the selection of seed from *Hevea brasiliensis*. A short note on the growth of Maniçoba rubber trees in the Malay Peninsula appeared in the number (11) of the *Agricultural Bulletin of the Straits and Federated Malay States* for November, 1909, p. 522. The seedlings of *M. dichotoma* and *M. pianhyensis*, on Tebrau estate, Tampoi, Johore, then 10 months old, showed a more rapid growth than Para rubber seedlings, the biggest plant being over 15 ft. high and 8 in. in circumference at 3 ft. from the base. The soil is light and sandy and the annual rainfall is about 100 in. At Singapore the results were similar, the young trees being from 8–12 ft. high, with an average girth of 4 in. According to an account published in the *India Rubber World*, May 1, 1909, pp. 279, 280, an American firm some 4 years before began to lay out plantations of "Maniçoba

Rubber," near São Raymundo, Piauhy, Brazil, which are now becoming important. The Jequié and Remanso rubbers—*M. dichotoma* and *M. piauhyensis*—were the species planted and plantations were made in different situations. Some particulars as to the mode of tapping and the yield are given. The trees can be tapped when 3–4 years old, and there are two seasons of about 15 days each in the year. An average of 1 lb. of rubber per tree per year is considered a satisfactory yield, though 2 lbs. per tree has been obtained. The best time for tapping is said to be just after the rainy season when the leaves are falling. In a dry season the yield is markedly less. Some good figures of *M. piauhyensis* and *M. dichotoma* illustrate the article.

Cultivation of Funtumia elastica.—The Director has received the following interesting letter from Mr. G. L. Bates, Bitya, Ebolova, Cameroons, W. Africa. Mr. Bates went out to W. Africa in 1895, and in that and the following year communicated to Kew two sets of plants, numbering 297 specimens, from the neighbourhood of Batanga. In 1897 a set of 116 was received from him from the M'Komo river—as the Gaboon river is called above the estuary. These collections contained several new species, some of which have been named after him :—*Impatiens Batesii*, Wright, *Luffa Batesii*, Wright, *Mostuca Batesii*, Wright, *Oncinotis Batesii*, Stapf, &c.

Bitya, Ebolova,
6 Nov., 1909.

DEAR SIR,

I HAVE lately looked over with interest some old numbers of the Kew Bulletin which were sent to me in 1896–8 because they contained descriptions of some new plants that I had found and sent to Kew. Though I have not since been engaged in botanising in that way, I have become interested in the practical side of botany lately through attempts to raise a few rubber trees here. So I write to you of a few things I have learned by experience in that line, in the hope that you might find some parts of my letter of sufficient interest to publish in the Kew Bulletin.

The place which is now my residence is about 200 miles, by the crooked path—in a straight line it would be less—due east from Kribi on the coast. It is near the river Ja (or Dscha) where it makes its bend to the west, and is thus in the basin of the Congo.

The trees I have planted are *Funtumia elastica*, commonly known among white people who do not care for botanical accuracy as "Kickxia," and among the Bulu natives as "Eté." This species grows wild in this region, though not as abundantly as it does still further east, towards the eastern boundary of German territory. It is the only species of the genus found here, I believe; but between here and the coast *E. africana* is found. In buying seeds from the natives one has to be careful to get those of the right species.

I may here confine myself to what I have done this year, in starting from the seeds 1,000 trees. Some not very serious attempts

during 2 or 3 previous years need not be related, because the failure was due to causes that everyone ought to know to avoid, namely lack of sufficient care and cultivation.

My seeds this year were obtained in January, in the principal dry season, from pods then bursting on wild trees. In February I put them in moist earth, in little boxes, till they began to germinate. It is a month from the time the tip of the radicle emerges from the seed till the seed-leaves have fully opened. Thus my little seedlings were started by the time the rains began, in March.

Some were started in little cylinders made of hollowed-out short sections of the large leaf-stalks of the Raphia palm, the "bamboo" of this country. This method made easy work in transplanting, but it has not turned out well, and I will not try it again. The little trees so started have not grown so well as the others, and I think that the shell of hard palm wood has hindered growth by confining the roots. Some were started in tiny paper boxes, made of half envelopes cut in two, or of folded paper, filled with earth and set close together in a sort of shallow tray of native make. These trays could be easily handled, kept up on my verandah, watered, and set in the sun or the shade. The seeds in these paper boxes all grew. During the month the paper became soft, but it still held together sufficiently to keep the earth about each plant in a separate lump, and made transplanting easy. This was done on rainy days. The trees started in this way have grown well. Some others merely started in a bed in the ground, which was kept watered, were transplanted also in the first rains and did well.

The ground where the trees were planted permanently was all cleared and burnt over before the rains, and a small space was dug up with a hoe at the spot where each tree was to stand. I had not started enough seedlings to fill all the places thus prepared, and in the remaining places I planted seeds. These came up very poorly—in fact, only a small fraction came up. Some seemed to be rotted by the abundant rain ; many seemed to be unable to break through the hard crust formed on the surface of the ground by the rain and hot sunshine during the long time it takes them to germinate. They might perhaps have come up better if planted shallower. Yet I think the best way is to plant the seeds in papers or beds before the rains begin, and water ; and then transplant during the rains.

As for the growth of all these plants started in these various ways it has been, during the eight months up to the present time, mainly in proportion to the amount of hoeing they have had. On most parts of the ground, native crops have been planted between and about the little trees. Maize did not seem to hinder their growth, but cassava, and especially sugar-cane did so, if planted too close. One crop seemed to be not only not a hindrance, but a positive aid to the growth of the little trees, and that is ground-nuts. This may be due to the fact that the patches of ground-nuts were carefully tended and kept free from weeds by the native women, and were then all thoroughly dug up when the crop was dug. But I think possibly the plants of *Arachis hypogaea* have some positive beneficial effect on the soil. At any rate the little *Funtumia* trees growing where the rows ran through native ground-nut patches

have made better growth than any others. Some of these, and a few of the others, have attained a height of 2 feet, or a little more.

The average growth of the 100 plants has not been half that of these few favoured ones. Many have made a poor growth for the reasons already explained, namely, the confining of the roots by the palm shells in which some were planted, or the feeble constitutions of those few which came up from the seeds planted directly in the permanent rows after the rains began and beat the ground hard. Besides these, many are still small because they have been cut off by insects—I do not know of what kind. This insect cuts off the two highest leaves and the terminal bud between, and does it in the night. Plants so cut die if so small that no buds are left below the cut ; if buds are left, these grow, but very slowly. The little trees suffered from this cause even before transplanting, excepting those that were started in the trays on my verandah.

Trees of the size reached by these 1,000 now, as well as the few larger ones started in previous years, are liable to be injured by caterpillars which, if not removed, strip them of their leaves. I go over all my trees about once in a week or 10 days, and remove the caterpillars, which are easy to see and are never found on many trees at once. At the time when I was transplanting, last March, I also planted more seeds in nursery rows near my house. Here the ground was kept loose and clean ; the seeds came up well and the plants grew well. These were left over the dry season of June-August. There is a double year of two dry and two rainy seasons here. About the last of September, on several rainy days, I transplanted them into the places where trees were missing of the first planting. These trees last transplanted had grown to such a size that setting them out made much more work than the first transplanting in March, but most of them have lived and are beginning to grow again.

When the little *Funtumia* trees are about 6 inches high they begin to dichotomize. I have always picked off one of the terminal buds, whenever I have found two. This seems to be necessary in order to give the trees the proper shape at the start.

GEO. L. BATES.

Rubber Trees as Shade for Cacao.—Mr. A. E. Casse, who left Kew in March, 1900, to take up the position of Superintendent of the Plantations, Bayeux, Haïti, has sent the following notes on rubber trees as shade for cacao to the Director for publication. The question as to 'Shade or No Shade' for cacao has received considerable attention in the West Indies, and a short summary account of the matter with a list of reference will be found in the Kew Bull. Additional Series ix, pp. 98 and 102–104.

"As well among colonial planters as in the pages of periodicals devoted to tropical agriculture, a question often discussed is this : 'Can India Rubber and Cacao successfully and economically be

cultivated on the same field, and are the advantages derived from mixed cultivation sufficiently great to counterbalance the pernicious influence which one species may exercise upon the other?'

"It is generally accepted that the cacao tree during all stages of its development requires some shade and shelter, and it becomes naturally desirable to use for these purposes trees which could at the same time yield a product, and add to the revenue of the estate.

"Shade or shelter in cacao planting must be considered under two different heads according to its purpose and character, namely as *temporary* and *permanent* shade.

"Under the term *temporary shade* we wish to refer to the protection required during the first years after the establishment of the plantation, before the trees planted for permanent shade have grown up. Since young cacao trees under all circumstances require more shade than mature ones, the temporary shade has to be more dense, and for this purpose therefore rapidly growing plants with large and abundant leaves are generally employed, as for example bananas. No rubber plants are suitable for temporary shade, and in the notes which follow, conditions governing the planting of permanent shade trees will therefore be exclusively considered.

"The requirements for shade vary considerably according to locality, variety of cacao, and distance at which the cacao trees are planted; whilst protection against prevailing winds will almost always be necessary. Overshading is often practised, and the prevalence of much fungoid disease is often due to mistakes in this direction.

"An ideal shade tree should answer the following requirements:—

"A tall-growing tree developing its branches about 12 feet above the ground; the branches should be strong and elastic, not liable to breakage in storms. The tree should be a subsoil feeder, and should change its leaves annually, without being decidedly deciduous. It should be a rapid grower, and yield a marketable product, without drawing too much on the fertility of the land. It should of course be a tree not requiring shade for its own proper development.

"It would carry us too far to review here the numerous trees which are met with planted as shade among cacao; few or none answer all the above mentioned requirements. What particularly interest us are the commonly planted rubber trees.

"*Hevea brasiliensis* is a tall and rapid grower, developing a good and high shade. It is however a surface feeder with a very dense root system, liable to mat the soil and thus interfere with the development of the cacao roots. As has been proved in the West Indies, *Hevea* may grow well without developing sufficient latex to pay tapping, and it cannot therefore be generally recommended.

"*Funtumia elastica* is decidedly a forest tree, requiring shade for its own development and can therefore be left without further consideration.

"The species of *Ficus* offer great advantages as windbreaks, planted at some distance from the cacao, as for instance on the opposite side of roads or canals. For shade inside the plantation they are too bulky and the root system is too wide and dense.

"The *Manihot* species, except *Manihot Glaziovii*, which is of a doubtful value as a rubber producer, grow too low. To this it must be added that the branches of all species of *Manihot* are very brittle, and that these trees prefer soil and climatic conditions which do not suit the cacao tree.

"*Castilloa elastica*, therefore, remains as the rubber tree most likely to give satisfaction, and it is probably also this tree which has most frequently been tried and recommended. A native of the same countries as *Theobroma Cacao*, its general climatic requirements are the same. As regards soil, *Castilloa* thrives well on any good cacao land, but it is less particular, and will grow well on both lighter and heavier soils when the drainage is satisfactory. *Castilloa elastica*, like the cacao, prefers much water and atmospheric humidity, but it is very susceptible to damage through the least stagnation of subsoil water and acidity of soil.

"Although *Castilloa* in its native country is found growing in the forests it is not really a forest tree, but a 'Tree weed' as it has been termed by Mr. O. F. Cook, in his report on 'The Culture of the Central American Rubber Tree,' Washington, 1903, by which term he understands a tree which can not grow up in the natural forest, but will develop rapidly on clearings, old garden sites, &c., where the slower-growing forest trees follow and surround it. In cultivation it is able to develop to perfection without shade, even on rather dry land, though it grows more rapidly when slightly shaded during the first years.

"On fair cacao land, *Castilloa* will reach a height of 25 to 30 feet within the first 4 years, and it is only when the tree is about 3 years old that it commences to develop permanent branches; before this the only branches developed are pseudo-branches which, like the leaves, are shed every year. The pseudo-branches carry all the foliage of the tree, and when the growth is healthy the development both on the main stem and on the permanent branches is very rapid. The permanent branches remain few, but with their abundance of pseudo-branches, they form a dense crown affording good shade.

"In localities where dry weather prevails during the months of March and April, the habit of *Castilloa* is decidedly deciduous, and it drops all its pseudo-branches during a short period; while in districts where the spring weather is damp the change of foliage is gradual. The fact that the tree may thus stand naked for some time forms the principal objection to its usefulness as a shade for cacao, whilst the abundance of mulch formed by its leaves is a point in favour of its planting.

"On fertile cultivated land *Castilloa* is a surface feeder, and develops very heavy roots, which run far, without however forming a dense system, as is the case with *Hevea*. When manure is dug down for the benefit of the cacao trees, the roots of both cacao and rubber develop equally well in it, very differently from what is the case when manure is dug into land planted with bananas and cacao, in which case the banana roots grow rapidly and densely into the manure to the exclusion of the cacao roots. It would appear that the roots of cacao and *Castilloa elastica* agree well in the same soil. The facts that the crop of rubber removes practically nothing

from the land, and that the evaporation of water from the *Castilloa* tree is likely to be less than from ordinary shade trees, speak in favour of its extensive planting among cacao.

"It has often been stated that *Castilloa elastica*, under cultivation, will not yield rubber in paying quantities. It would go beyond our object on this occasion to enter into a description of the methods and economies of rubber tapping; we therefore limit ourselves to stating that, if the right varieties be chosen for planting, excellent returns may be obtained."

Guayule Rubber.—An account of this Mexican source of Rubber, derived from *Parthenium argentatum*, A. Gray, was published in the *Bulletin* 1907, pp. 285–294, with a further note in the *Bulletin* for 1908, p. 255. In 1907 some seeds of *Parthenium argentatum* and also of *P. incanum*,—a species sometimes confused with the rubber-yielding plant (cf. *K.B.* 1907, p. 294)—were received from the United States Department of Agriculture. The plants of Guayule raised from these seeds are now about 18 inches high and in flower, the stem is woody below and the silvery leaves, 2 inches long, are lanceolate, entire or in a few cases irregularly lobed or toothed. The plants of *P. incanum* have glaucous or silvery hawthorn-like leaves and in their crenate lobation differ markedly from the leaves of *P. argentatum* where the lobes are sharply angular.

Through the kind offices of Mr. Reginald Tower, H.M. Minister, Mexico, two consignments of the seeds of *Parthenium argentatum* were received at Kew in March and April of this year. The first consignment was sent to Mr. Tower by Mr. J. E. Kirkwood of the University of Montana, Missoula, the author of a paper on the "Propagation of Guayule by seeds" in the American Review of Tropical Agriculture, vol. i, No. 2, February, 1910, pp. 34-43. The second consignment of seeds was sent by Mr. Tower from Mr. G. Fleming of the Hacienda de Cedros, Mazapil, Zacatecas.

The bulk of the seeds so received has been distributed to Mysore, Baroda, Poona, Lahore, Ceylon (Hakgala), Sudan, Pretoria, Nairobi, Queensland, Port Darwin, Adelaide, Sydney and the Antilles.

The germination of the seeds retained at Kew has been good; the plants raised from the later sending in April are now 6 inches high and bear somewhat silvery, oblanceolate, slightly lobed leaves 3–4 in. long. The older seedlings are a foot high, the whole plant being covered with a fine silvery-grey tomentum; the leaves are 2–5 in. long, narrowly lanceolate and irregularly lobed with angular acute or subacute lobes. Some of the plants, which are already shewing flower heads, have been placed in the Succulent House.

In the *Bulletin* 1908, p. 255, a despatch from H.M. Minister, Mexico, was published, in which the Guayule Rubber industry did not appear to have a very bright future; a further despatch received from Mr. Tower, early last year, indicates that the industry is still in a flourishing condition. The Mexican Rubber Exploitation Company now have a large Guayule factory established in the State of Coahuila and with a new process for the extraction

of the rubber they have confidence in the successful development of the industry. According to the statements made by the head of the company, "Experiments had now satisfied them conclusively that the Guayule plant reproduces itself naturally and abundantly. The roots of the shrub extend to a considerable distance in all directions, and new shoots spring from the roots, growing satisfactorily even after the present shrub has been cut down. Opinions differ about the life of the plant and as to the suitable time for cutting, but the generally accepted view is that between ten and twenty years must elapse before maturity is reached and the plant contains sufficient rubber for commercial purposes." A further despatch from Mr. Tower, printed below, gives some additional information as to the successful development of the Guayule industry.

Mexico,

March 23rd, 1910.

SIR,

WITH reference to my Despatch of this Series, No. 52 of December 3rd, 1906, and subsequent reports concerning the Guayule rubber industry in Mexico, I have the honour to report the following which has been published in the "Mexican Herald" of the 19th instant :—

"More attention will be paid to the culture of Guayule during 1910 than in any previous year. Statistics and reports in the Department of Fomento show that the increase in the production of this rubber-producing shrub has been greater than any other product of the northern section of the Republic.

"A few years ago the shrub only brought $25.00 (say £2 10*s.*) a ton in the open market. This price has risen very rapidly, as the splendid properties of the plant have become better known, until at the present time it is selling for $150.00 (say £15) a ton.

"At the present price the profit to the grower is large and is resulting in a greatly increased acreage in the Northern States of the Republic, where the plant seems to do the best. The estimates in the hands of the Department of Fomento indicate that the acreage for the present year will be more than 30 per cent. greater than that of last year."

I have, &c.,

(Signed) REGINALD TOWER.

The Right Honourable
Sir Edward Grey, Bart., M.P.,
&c., &c.

Some account of the extraction and manufacture of Guayule rubber is given in the *Journal of Industry and Engineering* for April, 1909, and a general account of the plant and the rubber industry by Professor F. E. Lloyd appeared in the *India Rubber World*, Jan. 1st, 1910, pp. 115–118. This article opens with a short history of the plant followed by a description ; the methods of rubber extraction, the future and extent of the rubber industry and other matters are also discussed. There are some good illustrations of the plant included in the text.

Epacris
breviflora
bawbawiensis

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1910.

XXXI.—EPACRIS HETERONEMA, Labill., AND E. DUBIA, Lindl.

(With Plates.)

O. Stapf.

In *Flora Australiensis* (vol. iv., p. 239) the area of *Epacris heteronema*, Labill., is described as including Tasmania and parts of Victoria and New South Wales. The Tasmanian specimens, with one exception, are referred to typical *E. heteronema*, the remainder to a "var. ? *planifolia*," whilst, in a note, *E. dubia*, Lindl., is said to be possibly a garden variety of *E. heteronema*. With respect to this *E. dubia*, certain questions have been referred to Kew by Mr. J. H. Maiden, Director of the Botanic Gardens, Sydney, New South Wales, with a view to finding out what Lindley's plant might be. They were occasioned by a note in the *Kew Bulletin*, 1909, p. 228, in which an *Epacris* that had flowered at Kew was with some reserve referred to *E. dubia*, as var. *subreflexa*. It was clear from the note that in *E. heteronema*, in the sense of the *Flora Australiensis*, we had to deal with an ill-defined type which required further and closer examination. This examination has been carried out and the results are embodied in the subjoined remarks.

Epacris heteronema was discovered by Labillardière in Recherche Bay in the extreme south of Tasmania, and described and very well figured in his Novae Hollandiae plantarum specimen (vol. i., p. 42, tab. 56) in 1804. One of Labillardière's original specimens is at Kew, and there can be no doubt as to the plant which he meant. Mr. Maiden collected it again in the "locus classicus" two years ago. The other localities of *E. heteronema*, Labill., represented at Kew, are :—South Port, about 10 miles north of Recherche Bay, Mt. La Perouse, north-west of Recherche Bay, Port Davey, on the south-west coast of Tasmania, and "high healthy plains between the Franklin and Gordon Rivers near Macquarie Harbour," about 50 miles north of Port Davey.

In 1833 an "*Epacris heteronema*" was figured in the Botanical Magazine (tab. 2357), from a specimen grown at Kew, and it was stated that the plant had been introduced by A. Cunningham from the Blue Mountains (New South Wales). This "*E. heteronema*" of the Botanical Magazine was soon afterwards recognised by A. P. De Candolle as a form distinct from the Tasmanian plant and

(17122—6a.) Wt. 92—428. 1375. 8/10. D & S.

described in his Prodromus (vol. vii., p. 762) as var. "*β ? subreflexa*" with the additional observation "An species propria." In the *Flora Australiensis* De Candolle's name does not appear; but the Botanical Magazine figure is quoted under "var. ?*planifolia*" of *E. heteronema*. The specimen from which this figure was drawn is preserved, and it is quite clear that it agrees absolutely with the plant referred to *Epacris dubia*, as var. *subreflexa*, N.E. Br., in the *Kew Bulletin* for 1909. But from a comparison of the flower it is equally evident, first that the cultivated plant is specifically identical with the specimen collected by A. Cunningham in New South Wales, and labelled "a tall twiggy shrub in elevated swampy lands B. Mountains, W. Port Jackson and Country N. from Bathurst, O. Nov. 1822"; and secondly, that the New South Wales plant is distinct from that of Southern Tasmania, as was already suggested by A. P. De Candolle. In fact, Bentham himself at one time held that view and actually gave the cultivated plant a new name; for there is in his herbarium a specimen of the Botanical Magazine plant from "Hort. Soc. Hort. Lond., 1840," named "*Epacris heteronema*," to which he added "Hook. non Labill.," and further "*Epacris breviflora*, Benth., Botanist, t. — ," a name which, however, was never published. It is true the cultivated specimens differ somewhat from those of the wild plant in habit; but the differences are almost entirely due to the lengthening of the internodes and the consequently looser disposition of the leaves, a change from the wild type which might be expected under cultivation. Cunningham's plant, for which Bentham's very appropriate name *E. breviflora* may be retained, has since been repeatedly collected, and of the Kew specimens the following are referable to it:—New South Wales, New England, C. Moore; Muniong Range, Mt. Kosciusko, Maiden and Forsyth; Victoria, Australian Alps, at the sources of the Mitta Mitta River, at 1300 m., in the Buffalo Range and on Mt. Aberdeen, three gatherings all by F. von Mueller. This accounts for all the localities quoted in *Flora Australiensis* under *E. heteronema* var. *planifolia*, with the exception of Mount Baw Baw, Victoria, and South Port, Tasmania. The specimens from these two localities are distinct from each other, nor are they referable to *E. heteronema* or *E. breviflora* or, in fact, to any of the other species so far described; they have therefore to be treated as new. Their characters may be gathered from the descriptions given below. As to their affinities it is difficult to pronounce without overhauling the whole genus; but it may be said that at the present they will best be placed near *E. myrtifolia* and *E. exserta*.

The cultivated specimens of *E. breviflora* have, as already stated, been connected with Lindley's *E. dubia*. This was described and figured in the Botanical Register, 1846, tab. 33, from a plant sent to Lindley by a Mr. Jackson, a nurseryman in Kingston. Nothing more is known about it, and there is no specimen of it extant either at Kew, the British Museum, or in Lindley's herbarium at the University of Cambridge. Lindley says he took it at first for *E. heteronema*, but afterwards found it to differ in the leaves. He might have added, that it differed still more in the flower which he figured in detail. But in spite of the description and the accompanying plate the species is dubious, and will for ever remain so

unless the original specimen should be found. This uncertainty is due entirely to the discrepancies between the description which is too short to stand by itself and the figure which, if Lindley's very precise statements are worth anything, shows a great lack of accuracy. Lindley insists upon the leaves being terminated by a "blunt callus" (callo obtuso apiculatis) and being "not merely slightly three-ribbed at the base, but plainly so through their whole length," while the artist represented them as very acute or even produced into a fine pungent mucro and without any indication of ribs. Then in the description the anthers are said to be "subinclusae," but in figure 1 representing a corolla cut open, the tips of the anthers, which are drawn rather clumsily, reach just up to the sinuses between the lobes, and in the principal figure they are shown as red dots more or less exserted from the corolla tube. The description of the leaves up to a certain point suggests *E. exserta*, but as the leaves are said to be obsoletely denticulate and the corolla lobes acute, that species hardly comes into consideration. One point, however, which is clearly brought out in figure 1, is of importance, namely the length of the style which at least equals the corolla tube. This character alone excludes *E. heteronema* and *E. parviflora*; it would not, however, militate against a close connection with *E. exserta*. It may be added that R. Brown's specimen of *E. exserta* at Kew, from Port Dalrymple, and also some of those in the herbarium of the British Museum, are written up "*Epacris dubia*"; but the writing is R. Brown's and much older than Lindley's description of *E. dubia*. Possibly it was never intended for a specific name and stood merely for "a dubious species."

E. heteronema of the *Flora Australiensis* is therefore a composite species, made up of four distinct elements, none of which can be identified with *E. dubia* of Lindley, a veritable "species dubia." To bring out the more salient distinctive characters of the four species in question they have been set out in the form of a key.

Style as short as or shorter than the ovary, not exserted from the mouth of the corolla; filaments much shorter than the anthers, these subsessile in the throat; leaf margins minutely serrulate; bracts and sepals ciliolate.

Corolla tube cylindric, at least as long as the lobes, 4 mm. long; stigma below the mouth of the corolla 1. *E. heteronema.*

Corolla tube very short, funnel-shaped, scarcely half as long as the lobes, 1·5 mm. long; stigma at the level of the mouth of the corolla ... ... 2. *E. breviflora.*

Style several times longer than the ovary, distinctly exserted from the mouth of the funnel-shaped corolla tube, which is as long as or slightly longer than the lobes.

Filaments shorter than the anthers, these subsessile in the mouth of the narrowly funnel-shaped corolla tube; leaf margins minutely serrulate; bracts and sepals cilolate. 3. *E. bawbawiensis.*

Filaments longer than the anthers, these completely exserted from the mouth of the widely funnel-shaped corolla tube; leaf margins smooth, rounded; bracts and sepals eciliolate. 4. *E. Stuartii.*

E. heteronema, *Labill.*, Nov. Holl. Pl. i. 42, tab. 56. *Frutex* multiramosus, ramis pubescentibus vetustis cortice cinereo vel nigrescente tectis. *Folia* creberrima, subpetiolata, ovata, basi rotundata, acuminata, aceroso-mucronata, 5–9 mm. longa, 2·5–4 mm. lata, crasse coriacea, margine sub lente minute serrulata, supra ad basin plerumque parce puberula, nervis subtus tenuibus saepe obscuris subparallelis. *Flores* plerumque versus apices ramulorum aggregati, hincinde secundum ramulos dissiti. *Bracteae* ovatae vel (superiores) lanceolatae, acutae, margine minute ciliolatae, interdum in dorso pubescentes. *Sepala* bracteis praecedentibus simillima, 4–5 mm. longa. *Corollae* tubus cylindricus, 4–5 mm. longus ; lobi ovati, subobtusi, quam tubus paulo breviores. *Antherae* filamentis brevissimis sub fauce corollae ortis insidentes, apicibus ex ore vix exsertis. *Stylus* 1·5–2 mm. longus ; stigmate incluso. R. Br. Prodr. 551 ; DC. Prodr. vii. 762 ; Hook. Fl. Tasman. i. 259; Benth. Fl. Austr. iv. 239, excl. var.

Tasmania. Kent Co. : Recherche Bay, *Labillardière* ! *Maiden* ! base of Mt. La Pérouse, *F. v. Mueller* ! South Port, *Stuart* ! Port Davey, *Milligan*, *Herb. Gunn*, 1207 ! Franklin Co. : high heathy plains between the Gordon and Franklin Rivers, near Macquarie Harbour, *Gunn*, 1208 !

The plant seems generally to be a small or even dwarf shrub, but on Mt. La Pérouse it grows, according to F. v. Mueller, 6–11 m. high.

The specimens from Macquarie Harbour differ from the rest in so far as the bracts are more or less silky pubescent on the back. The locality being rather distant from the principal area, this pubescence may indicate the presence of a local variety which at present cannot be defined more exactly.

2. **E. breviflora**, *Stapf.* *Frutex* (teste *Cunningham*) altus, multiramosus, ramis pubescentibus vetustis cortice fusco obtectis. *Folia* creberrima, subpetiolata, elliptico-ovata, a medio basin versus angustata, acuta vel acuminata, aceroso-mucronata, 6–9 mm longa, 3–5 mm. lata, coriacea, margine sub lente valido minutissime serrulata, glaberrima, subtus saepe nervoso-striata, nervis subparallelis vel flabellatis. *Flores* versus apices ramulorum capitatim vel subspicatim congesti. *Bracteae* ovatae, superiores elongatae, acutae, margine minutissime ciliolatae. *Sepala* bracteis praecedentibus simillima, sub anthesi 3–3·5 mm., matura 4 mm. longa. *Corollae* tubus breviter infundibuliformis, 1·5 mm. longus ; lobi ovati, subobtusi, tubo duplo longiores. *Antherae* filamentis brevibus sub fauce corollae ortis insidentibus, apicibus ex ore vix exsertis. *Stylus* 0·75 mm. longus ; stigmate incluso. *Capsula* 2 mm. alta. *E. heteronema*, Hook., Bot. Mag. tab. 3,257, non Labill. ; *E. heteronema*, β. ? *subreflexa*, DC, Prodr. vii. 762. *E. heteronema*, var. ? *planifolia*, Benth. Fl. Austr. iv. 239 *ex parte*. *E. dubia*, var. *subreflexa*, N. E. Br. in Kew Bulletin, 1909, 228.

New South Wales. Blue Mountains : West of Port Jackson and Country North of Bathurst, *Cunningham*, 151 ! New England, comm. *C. Moore* ! Muniong Mountains : without precise locality, *F. v. Mueller* (according to Bentham) ; Mt. Kosciusko, *Maiden and Forsyth* !

VICTORIA. Buffalo Range : Sources of the Mitta Mitta River, 1,300 m., *F. v. Mueller* ! Mount Aberdeen, *F. v. Mueller* !

E. bawbawiensis, *Stapf*. *Frutex* multiramosus, ramis pubescentibus gracilibus cortice fuscescente obtectis, *Folia* creberrima, subpetiolata, late lanceolata, acuta, mucronata, 6–7 mm. longa, circiter 3 mm. lata, coriacea, margine sub lente serrulata, glaberrima, nervis obscuris. *Flores* ad apices ramorum congesti. *Bracteae* ovatae vel elliptico-ovatae, subacutae, margine minutissime ciliolatae. *Sepala* bracteis praecedentibus simillima, 5 mm. longa. *Corollae* tubus cylindricus, superne paulo ampliatus, 4–4·5 mm. longus ; lobi ovati, obtusi, ad 3 mm. longi. *Antherae* filamentis brevibus sub fauce corollae ortis insidentibus, apicibus ex ore vix exsertis. *Stylus* medio incrassatus, 4·5 mm. longus ; stigmate stamina superante. *E. heteronema* var. ? *planifolia*, Benth., Fl. Austr. iv. 239 *ex parte*.

VICTORIA. Mt. Bawbaw, *F. v. Mueller* !

E. Stuartii, *Stapf*. *Frutex* multiramosus, ramis pubescentibus cortice fusco obtectis. *Folia* creberrima, subpetiolata, ovata, basi late rotundata, acuta vel breviter acuminata, pungentia, 4·5–5·5 mm. longa, 3·5–4 mm. lata, valde coriacea, margine laevissimo, nervis subtus plerumque 3 prominulis vel subobscuris. *Flores* ad apices ramorum capitatim vel spicatim congesti. *Bracteae* ovatae, vel superiores ovato-lanceolatae, acutae, eciliolatae. *Sepala* bracteis praecedentibus simillima, vix 4 mm. longa. *Corollae* tubus cylindricus, superne paulo ampliatus, 4 mm. longus, lobi ovati, subacuti, tubum aequantes. *Antherae* filamentis iis longioribus in fauce corollae ortis insidentibus ex ore totae exsertae. *Stylus* medio paulo incrassatus, ad 5 mm. longus; stigmate apices antherae aequante, in fructu calycem 2 mm. superante. *E. heteronema* var. ? *planifolia*, Benth., Fl. Austr. iv. 239, *ex parte*.

TASMANIA. Kent Co. : South Port, *Stuart* !

EXPLANATION OF PLATE.

Epacris heteronema.

1, leaf ; 2, flower with involucre of bracts ; 3, bract : 4, flower cut open ; 5, stamen.

E. breviflora.

6, leaf ; 7, flower with involucre of bracts ; 8, bract ; 9, flower cut open ; 10, corolla ; 11, stamen.

E. bawbawiensis.

12, leaf ; 13 flower with involucre of bracts ; 14, bract ; 15, flower cut open ; 16, stamen.

E. Stuartii.

17, leaf ; 18, flower with involucre of bracts ; 19, bract ; 20, flower cut open ; 21, stamen.

All the figures × 4, excepting fig. 10, which is × 6.

XXXII.—NEW LAURACEAE FROM THE MALAYAN REGION. II.

J. S. Gamble.

Cinnamomum graciliflorum, *Gamble* [Lauraceae-Cinnamomeae]; species *C. paucifloro*, Nees, affinis, sed foliis tenuioribus costis lateralibus ad basin acuminis productis differt. Foliorum forma et acumine etiam ad *C. rhyncophyllum*, Miq., accedit, sed flores omnino diversi.

Arbor; ramuli graciles, teretes, juniores puberuli. *Folia* chartacea, opposita; elliptica vel elliptico-ovata vel elliptico-lanceolata, apice longissime acuminata acumine obtuso, basi paullo rotundata; supra glabra, infra glaucescentia; 7–13 cm. longa, 3–6 cm. lata; costae 3, interdum 2 minimis ad basin additis, media in acumen producta, laterales acuminis ad basin et inde arcuatae; nervi nulli; nervuli transversi irregulares, arcuati; reticulatio areolata; petiolus gracilis, niger, 5–10 mm. longus. *Flores* 3–5, extus glabri, in racemis gracilibus axillaribus vel lateralibus paucifloris ad 4 cm. longis; pedunculi et pedicelli capillares, glabri. *Perianthii* tubus campanulatus, 1 mm. longus, intus glaber; lobi ovato-oblongi, intus griseo-pubescentes, 2 mm. longi. *Stamina* gracilia praeter basin glabra; antherae interdum 2-locellatae; ordinis I et II ovatae; ordinis III similes sed filamentorum ad apices glandulis binis sessilibus munitae; staminodia ordinis IV cordata, acuta. *Ovarium* ovoideum, stylo tenui, stigmate parvo capitato. *Drupa* ovoidea, 10 mm. longa, 8 mm. diametro, cupula 6 mm. diametro, pedicello obconico; pericarpium flavescens, crustaceum.

Malay Peninsula. Perak: at Gunong Ijuk, *Scortechini*, 1228; in Upper Perak, *Wray*, 3664.

Cinnamomum Ridleyi, *Gamble* [Lauraceae-Cinnamomeae]; species quoad folia *C. paucifloro*, Nees, affinis, sed inflorescentia maxime differt.

Arbor; ramuli rubro-nigrescentes, laeves, juniores griseo-puberuli. *Folia* chartacea, opposita vel subopposita, elliptico-lanceolata, longe acuminata, acumine obtuso, utrinque glabra, supra lucida, 10–17 cm. longa, 2·5–6 cm. lata; costae 3 prominentes, media in acumen producta, laterales ad basin acuminis; nervi nulli, paucis extra costas laterales exceptis; nervuli transversi plurimi, subparalleli, arcuati, reticulatione obscura; petiolus nigrescens, 10–15 mm. longus. *Paniculae* griseo-tomentosae, pedunculatae, axillares vel laterales, ad 10 cm. longae ex ramulis ultimis; bracteae minutae; pedicelli graciles. *Perianthii* tubus brevis, intus villosus; lobi ovati, 2·5 mm. longi, villosi. *Stamina* filamentis subglabris, ordinis I et II 2 mm. longa, spathulata, antheris oblongis et thecis superioribus parvis; ordinis III etiam 2 mm. longa, glandulis 2 cordatis sessilibus ad mediam partem filamentorum munita; ordinis IV staminodia cordata, 1 mm. longa, villoso-stipitata. *Ovarium* ovoideum, glabrum, stylo gracili, stigmate peltato. *Drupa* ovoidea, apiculata, 10 mm. longa, 7–8 mm. diametro; cupula 5 mm. diametro, margine integra; pericarpium nigrum, lucidum.

Malay Peninsula. Singapore: at Changi road, *Ridley*, 4823.

Cinnamomum Deschampsii, *Gamble* [Lauraceae-Cinnamomeae]; *C. zeylanico*, Garc., affinis, foliis tenuioribus ellipticis apice obtusis differt.

Arbor; ramuli graciles, teretes, fusci, juniores alabastraque griseo-sericei. *Folia* subcoriacea, opposita vel subopposita, elliptico-ovata vel -oblonga, apice obtusa et glanduloso-apiculata, basi rotundata vel parum attenuata, utrinque glabra, siccitate cinereo-grisea, supra lucida, infra glauca, marginibus cartilaginea, 7–11 cm. longa, 4–6 cm. lata; costae 3, media in apicis glandulam, 2 laterales ex basi curvatae et apicem versus in sinus arcuatos desinentes; nervi 0, vel interdum utrinque 1 costis lateralibus conjunctus; nervuli transversi subparalleli, reticulatioque obscuri; petiolus niger, 5–10 mm. longus. *Paniculae* pedunculatae, axillares, griseo-sericeae, ad 15 cm. longae; pedunculi filiformes, 4–7 mm. longi, ramuli etiam filiformes; pedicelli graciles, 5 mm. longi. *Perianthii* tubus brevissimus, vix 1 mm. longus, intus glaber; lobi oblongi, acuti, 2–3 mm. longi, utrinque griseo-sericei. *Stamina* gracilia, 1–2 mm. longa, filamentis glabriusculis, ordinis I et II antheris oblongis; ordinis III antheris minoribus, thecis superioribus minimis et glandulis reniformi-cordatis glabris stipitatis paullo supra basin filamentorum insertis; ordinis IV staminodia sagittata, 1 mm. longa, villoso-stipitata. *Ovarium* obovoideum, stylo crassiusculo et stigmate peltato. *Drupa* non visa.

Malay Peninsula. Penang: on roadsides in the mountains, *Deschamps.* Singapore, in garden jungle, *Ridley*, 12595.

Cinnamomum Scortechinii, *Gamble* [Lauraceae-Cinnamomeae]; species distincta, foliis coriaceis infra tomentosis et paniculis brevibus paucifloris.

Arbor cortice tenui fusco sapore cinnamomeo; ramuli fusci, teretes, juniores subangulati, ferrugineo-tomentosi. *Folia* coriacea, opposita vel subopposita, elliptica vel elliptico-lanceolata, apice acuta vel obtuse acuminata, basi attenuata vel paullo rotundata, supra costis exceptis glabra, infra dense griseo-ferrugineo-tomentosa, marginibus reflexis; 7–12 cm. longa, 2·5–5 cm. lata; costae 3, infra impressae, 2 laterales e media 5–7 mm. supra basin ortae, non semper oppositae, apicem versus curvatae et paullo infra apicem desinentes; nervi extra costas laterales utrinque 3–5, oblique marginem versus curvati et arcuati; nervuli transversi subparalleli, distantes; petiolus crassus, ferrugineo-tomentosus, 10–15 mm. longus. *Paniculae* axillares, pauciflorae, ferrugineo-tomentosae, ad 7 cm. longae; pedunculus gracilis, ramuli breves; pedicelli etiam breves, 2 mm. longi. *Perianthii* tubus brevis, vix 2 mm. longus, intus glaber; lobi ovati, acuti, intus dense ferrugineo-villosi, 2–3 mm. longi. *Stamina* crassa, filamentis latis pubescentibus; ordinis I et II spathulata, thecis magnis; ordinis III cum glandulis 2 glabris reniformibus ad filamentorum dimidium insertis; ordinis IV staminodia sagittata, 1·5–2 mm. longa, pubescentia, stipitata. *Ovarium* obovoideum, villosum, stylo crassiore et stigmate peltato. *Drupa* ovoidea, cupula apice truncata.

Malay Peninsula. Perak: at camp on Ulu Batang Padang, 1500 m., *Wray*, 1520; *Scortechini*, 322.

Cinnamomum aureo-fulvum, *Gamble* [Lauraceae-Cinnamomeae]; *C. Scortechinii*, Gamble, affinis, quoad folia infra tomentosa, sed tomento aureo-fulvo, etiam foliis basi et apice acuminatis et nervis extra costas laterales nullis differt.

Arbuscula; ramuli graciles, dense aureo-fulvi, pubescentes. *Folia* subcoriacea, subopposita, elliptico-lanceolata, apice longe acuminata, basi acuminata, supra molliter adpresse griseo-pubescentia, infra dense aureo-fulva; 6–8 cm. longa, 1·5–3 cm. lata; costae 3, media ad acuminis finem, 2 laterales e media 3–5 mm. supra basin ortae vix ad acuminis basin attingentes; nervuli transversi subparalleli, arcuati, obscuri; petiolus gracilis, 1·5–2·5 cm. longus, dense pubescens. *Flores* in dichasia pedunculata gracilia fulvo-tomentosa ex axillis foliorum ultimorum orta, ad 4 cm. longa dispositi; pedunculi circiter 3 cm. longi; pedicelli 2 mm. longi. *Perianthii* tubus campanulatus, 1 mm. longus; lobi oblongo-rotundati, subaequales, fulvo-pubescentes, 2 mm. longi. *Stamina* ordinum I et II parva, 1·5–2 mm. longa, filamentis latis villosis et antheris ovatis thecis minimis; ordinis III glandulis 2 magnis reniformibus glabris ad dimidiam filamentorum partem munita; ordinis IV staminodia 1·25 mm. longa, cordata, pubescentia, stipitata. *Ovarium* subglobosum, rugatum, parce hispidum; stylo gracili, stigmate acuto. *Drupa* non visa.

Malay Peninsula. Selangor: at Hulu Semangko on top of the hill, *Ridley* (?) 12,103 (Herb. Singap.).

Cinnamomum cinereum, *Gamble* [Lauraceae-Cinnamomeae]; foliis cinereis lanceolatis et costa media utrinque nervis 4–6 munita insigne.

Arbor ad 15–20 m. alta, 40–50 cm. trunci diametro; rami patentes, ramuli graciles, teretes, glauco-grisei. *Folia* subcoriacea, undulata, opposita vel subopposita, lanceolata, apice acuta, basi subcuneata, supra et infra glabra, supra lucida, infra griseo-cinerea, marginibus cartilagineis; 8–15 cm. longa, 3–5 cm. lata; costae 3, media conspicua, 2 laterales 5–15 mm. supra mediae basin ortae non semper oppositae, vix ultra medium elongatae, nervis utrinque 4–6 obscuris inter se et cum costis arcuatim junctis: reticulatio foliorum juniorum prominenter areolata, veteriorum obscura; petiolus 1–1·5 cm. longus, supra sulcatus. *Flores* pallide lutei, in paniculas ad 15 cm. longas griseo-pruinosas dispositi; pedunculi graciles, longi, parum complanati; pedicelli graciles. *Perianthii* tubus gracilis, intus glaber, 2 mm. longus; lobi ovati, 2·5 mm. longi, intus praesertim ad basin albo-villosi. *Stamina* gracilia, 2–2·5 mm. longa, ordinum I et II antheris oblongis et filamentis glabriusculis; ordinis III antheris minoribus, filamentis basi villosis et glandulis 2 glabris reniformibus stipitatis ad tertiam partem filamentorum insertis; ordinis IV staminodia 1·5 mm. longa, ovoidea, filamentis villosis. *Ovarium* ovato-oblongum, in stylum gracilem attenuatum, stigmate peltato obliquo. *Drupa* non visa.

Malay Peninsula. Perak: at Waterfall Hill, 360 m., *Wray*, 2629; near streams near Thaiping, 300–450 m., *King's Collector*, 8515.

Alseodaphne Wrayi, *Gamble* [Lauraceae-Cinnamomeae]; *A. pedunculari*, Hook. f., affinis, floribus majoribus, paniculis griseo-puberulis et drupa globosa minore differt.

Arbor ad 30 m. alta; ramuli graciles, cortice griseo. *Folia* membranacea, ad apices ramulorum plus minusve conferta, elliptico-lanceolata, apice obtuse longe acuminata, basi attenuata, supra glabra, infra minute puberula et punctata, denique glabra; 7–12 cm. longa, 3–5 cm. lata; costa gracilis, supra paullo impressa et carinata, infra prominens; nervi utrinque 10–12 irregulares, obliqui, marginem versus curvati et inde irregulariter arcuati; nervuli transversi et reticulatio vix prominentes; petiolus 1–1·5 cm. longus, infra sulcatus. *Paniculae* pedunculatae, ramulosae, griseo-puberulae, ex foliorum axillis ultimis ortae, ad 10 cm. longae et 5 cm. latae; pedunculi graciles, 4–5 cm. longi; cymulae 3–5-florae; pedicelli graciles, ad 7 mm. longi; bracteae ovatae, caducae. *Perianthii* tubus brevis; lobi subaequales vel exteriores paullo breviores, ad 2 mm. longi, intus et extra puberuli. *Stamina* ordinum I et II gracilia, clavata, 2 mm. longa, filamento connectivoque villosis; ordinis III similia sed thecis 2 superioribus minimis, glandulis ad basin filamentorum majoribus glabris; ordinis IV staminodia oblonga, glabra, glandulis aequalia. *Ovarium* ovoideum, glabrum; stylo gracili, stigmate peltato. *Drupa* globosa vel paullo ellipsoidea, 15 mm. diametro, perianthio persistente reflexo insidens, pedicello incrassato 2 cm. longo; pericarpium nigrum, lucidum.

Malay Peninsula. Perak: at Kota, *Wray*, 2543; near Larut, *King's Collector*, 5493, 5917.

Alseodaphne paludosa, *Gamble* [Lauraceae-Cinnamomeae]; cum duabus sequentibus foliis magnis percoriaceis et drupis maximis insigne. Ab *A. insigni*, Gamble, nervis foliorum impressis et apice emarginato, etiam drupa annulo destituta et perianthii lobis fructiferis persistentibus differt.

Arbor maxima, ad 24–30 m. alta, 1 m. trunci diametro; ramuli crassissimi, nigrescentes. *Folia* percoriacea, apice ramulorum fasciculata, obovata, apice obtusa vel emarginata, basi longe cuneata, supra glabra, lucida, infra glauca, marginibus recurvis; 20–25 cm. longa, 7–9 cm. lata; costa crassissima, infra plana; nervi utrinque 15–17, supra impressi; nervuli transversi pauci, irregulares, obscuri, reticulatione minute areolata sed vix prominente; petiolus crassus, 3–4 cm. longus. *Flores* haud bene noti, in paniculas racemosas e foliorum ultimorum axillis ortas 10–15 cm. longas dispositi; pedunculi et rhachis fructiferi prominenter verrucosi; pedicelli fructiferi obconici, complanati, 2–3 cm. longi. *Perianthii* lobi triangulares, 5 mm. longi, in fructu glabri, persistentes. *Stamina* gracilia, clavata, glabra, ordinum I et II 3 mm. longa; ordinis III 4 mm. longa et glandulis 2 magnis rotundatis munita; ordinis IV staminodia cordata, glabra, stipitata. *Drupa* oblongo-ellipsoidea, circa 2 cm. longa et 1 cm. diametro, apice depressa; pericarpium crassum, nigrum.

Malay Peninsula. Perak: in dense jungle on low wet ground in Larut, *King's Collector*, 5378.

Alseodaphne insignis, *Gamble* [Lauraceae-Cinnamomeae]; species insignis, a praecedente *A. paludosa*, Gamble, foliis vix emarginatis et drupa majore basi annulo circumdata differt.

Arbor maxima, ad 24–30 m. alta, circa 1 m. trunci diametro; ramuli crassissimi, fusci. *Folia* percoriacea, ad apices ramulorum

fasciculata, oblonga vel obovata vel oblanceolata, apice rotundata vel obtuse acuta, basi cuneata vel attenuata, glabra, supra lucida, infra coeruleo-viridia, marginibus crassis, magnitudine variabilia; 12–35 cm. longa et 5–10 cm. lata ; costa crassissima, nervi utrinque 12–15, prominentes ; nervuli transversi inconspicui, reticulatione haud prominenter areolata ; petiolus crassus, 3–6 cm. longus, supra sulcatus. *Paniculae* erectae, crassae, subterminales, minute puberulae, ad 15 cm. longae ; pedunculi et rhachis angulati, nigrescentes ; bracteae parvae, caducae ; pedicelli crassi ; in fructu paniculae 10–30 cm. longae. *Perianthii* lobi puberuli, 3 exteriores minores. *Stamina* gracilia, ordinum I et II 2 mm. longa, clavata ; ordinis III longiora et glandulis 2 glabris prope basin munita ; ordinis IV staminodia ovato-cordata, villosa, breviter stipitata. *Drupa* oblongo-ellipsoidea, lucida, glabra, ad 3·5 cm. longa et 2 cm. diametro, tubo perianthii incrassato annuliformi 2 cm. diametro insidens, pedicello incrassato clavato 2 cm. longo glaucescente et prominenter verrucoso.

Malay Peninsula. Perak : in dense forest near Larut, up to 300 m., *King's Collector*, 6608, 6958, 7273, 8451.

Alseodaphne Ridleyi, *Gamble* [Lauraceae-Cinnamomeae] ; species duabus praecedentibus affinis, drupa magna furfuracea praecipue differt.

Arbor mediocris ; ramuli crassissimi, pallide brunnei, lenticellati. *Folia* percoriacea, ad apices ramulorum conferta, elliptico-oblonga vel -obovata, saepius basi inaequalia, apice obtusa vel minute apiculata, glabra, supra lucida, infra glauca ; 13–25 cm. longa, 5–13 cm. lata ; costa crassissima, supra complanata ; nervi utrinque 12–15 irregulares, marginem versus curvati ; nervuli transversi irregulares ; reticulatio obscura, areolata ; petiolus crassissimus, basi rugosus, 2–4 cm. longus. *Paniculae* glabrae, 10 cm. longae, e foliorum ultimorum axillis ortae ; pedunculi crassi, complanati ; bracteae ovatae, acutae, 2–3 cm. longae ; cymulae pauciflorae ; pedicelli clavati, fructiferi multum incrassati. *Perianthii* tubus brevis ; lobi ovati, exteriores paullo minores. *Stamina* ordinum I et II minima, clavata ; ordinis III similia, glandulis 2 ad basin ovoideis ; ordinis IV staminodia ovata, glabra. *Drupa* magna, oblongo-ellipsoidea, apice depressa, 7–8 cm. longa, 4 cm. diametro, pedicello magnopere incrassato saepius 1·5 cm. lato insidens ; pericarpium crassum, cum rhachi et pedicello dense furfuraceum et pustulatum.

Malay Peninsula. Selangor : at 15th mile on Pahang track, *Ridley*, 8532.

Alseodaphne pendulifolia, *Gamble* [Lauraceae-Cinnamomeae] ; species distinctissima glandulis stamineis ad filamenta supra basin adjunctis, foliis submembranaceis pendulis magnis et paniculis subracemiformibus insignis.

Arbor, ad 12–18 m. alta, 20–40 cm. trunci diametro ; ramuli crassissimi, ultimi ad 1 cm. lati, rugosi. *Folia* submembranacea, ad apices ramulorum fasciculata, conspicua, pendula, obovata vel oblanceolata, apice obtusa vel brevissime acuminata, basi longe cuneata, utrinque glabra, siccitate rubescentia ; 17–35 cm. longa, 5–11 cm. lata ; costa gracilis ; nervi utrinque 15–20 marginem versus curvati, nervulis transversis multis irregularibus et reticulatione irregulariter areolata juncti ; petiolus gracilis, 2–4 cm. longus.

Flores pallide flavi, in paniculas subracemiformes longas glabras ex axillis foliorum ortas et iis subaequilongas dispositi ; pedunculus rhachis et ramuli paullo complanati, nigrescentes ; pedicelli graciles, clavati, 7 mm. longi. *Perianthii* tubus infundibularis, crassus ; lobi ovato-acuti, exteriores 1 mm. interiores 2 mm. longi. *Stamina* 1·5–2 mm. longa, antherarum thecis inaequalibus, ordinum I et II antheris ovatis et filamentis latis puberulis ; ordinis III antheris oblongis et glandulis 2 magnis subsessilibus paullo supra filamentorum basin insertis ; ordinis IV staminodia cordata, glabra, late stipitata. *Ovarium* ovoideum ; stylo brevi, stigmate parvo obtuso. *Drupa* (immatura) globosa, glabra, perianthii tubo et pedicello incrassato insidens.

Malay Peninsula. Perak : in dense forest, chiefly of bamboo, near Ulu Bubong and Ulu Kerling, up to 200 m., *King's Collector*, 8785, 10,623.

Alseodaphne borneensis, *Gamble* [Lauraceae-Cinnamomeae]; floribus magnis glabris et foliis conspicue areolatis subtus glaucis distincta.

Arbor ; ramuli crassi, albidi ; innovationes dense fusco-tomentosae ; perulae nullae. *Folia* coriacea, eximie reticulata, elliptico-obovata vel -oblanceolata, apice obtuse acuminata, basi cuneata vel attenuata; 10–25 cm. longa, 4–10 cm. lata; supra nitida, glabra, infra glauca ; costa profunde impressa, nervis lateralibus utrinque 10–12 subregularibus marginem versus arcuatis, reticulatione conspicue areolata prominente ; petioli crassi, 1–3 cm. longi, supra canaliculati. *Paniculae* subracemosae ex axillis supremis 4–8 cm. longae, glabrae, pauciflorae ; pedicelli 1 cm. longi, sursum dilatati, flores aequantes. *Perianthii* tubus brevis ; lobi oblongi, subaequales, 7–10 mm. longi, apice subacuti, utrinque glabri. *Stamina* gracilia, filamentis basi villosis, antherarum loculis ellipticis magnis ; antherae ordinis I et II latae, 2–4 mm. longae, apice obtusae; ordinis III paullo longiores subacutae, glandulis 2 magnis reniformibus ; staminodia ordinis IV ovato-cordata, glabra, 1·5 mm. longa, stipite villoso. *Ovarium* ovato-globosum ; stylo tenui, stigmate capitato. *Drupa* non visa.

Borneo. Sarawak : near Kuching ; *Haviland*, 3087, and 'd.k.r.v.'

Notaphoebe fruticosa, *Gamble* [Lauraceae-Cinnamomeae]; species obscura foliis *Alseodaphni pedunculari*, Hook. f., et *A. Wrayi*, Gamble, affinis sed floribus *Notaphoebi umbelliflorae*, Blume, accedit.

Frutex, ad 2–2·5 m. altus ; ramuli graciles, cortice griseo-albo, ultimi siccitate nigrescentes. *Folia* membranacea, ad apicem ramulorum sed haud arcte conferta, lanceolata vel oblanceolata, apice acuminata, basi cuneata, costa excepta glabra; 10–15 cm. longa, 3–5 cm. lata ; nervi utrinque 8–10 irregulares, marginem versus curvati et ibi gradatim arcuati; nervuli transversi pauci, vix conspicui, sed infra visibiles sicut reticulatio ; petiolus gracilis, 5–15 mm. longus. *Flores* minuti, 4 mm. diametro, in paniculas graciles glabras pedunculatas e foliorum ultimorum axillis ortas, ad 7 cm. longas dispositi ; pedunculi filiformes ; pedicelli etiam filiformes, clavati, ad 3 mm. longi. *Perianthii* tubus brevissimus ; lobi ovati, exteriores circa 1 mm. longi, interiores 1·5 mm., omnes glandulosi, intus puberuli. *Stamina* ordinum I et II minima, villosa, clavata,

1·5 mm. longa ; ordinis III paullo longiora, glandulis 2 villosis rotundatis ad basin munita ; ordinis IV staminodia obtusa, villosa. *Ovarium* oblongum ; stylo crasso curvato, stigmate magno peltato. *Drupa* non visa.

Malay Peninsula. Perak : at Tapa, *Wray*, 182 ; at Ulu Bubong and Larut, up to nearly 1000 m., *King's Collector*, 5448, 11,029.

Notaphoebe Kingiana, *Gamble* [Lauraceae - Cinnamomeae] ; *N. umbelliflorae*, Blume, affinis, sed foliis majoribus subcoriaceis, paniculis ferrugineo-tomentosis differt.

Arbor, ramis patulis, ad 12–18 m. alta, et 40–50 cm. trunci diametro ; ramuli mediocriter crassi, griseo-albi, lenticellati. *Folia* chartaceo-coriacea, elliptica vel elliptico-obovata vel -oblanceolata, apice obtuse acuta vel cuspidato-acuminata, basi cuneata vel paullo rotundata, supra lucida, costa excepta glabra, infra rubro-fusca, glabra; 10–25 cm. longa, 5–9 cm. lata; costa crassa; nervi utrinque 8–11 curvati, sub marginem arcuatim juncti ; nervuli transversi irregulares, distantes, cum reticulatione prominuli; petiolus crassus, 1–3 cm. longus, rugosus. *Flores* parvi, rubri vel lutescentes, in paniculas ferrugineo-tomentosas e foliorum axillis summorum ortas, 10–12 cm. longas et 4 cm. latas dispositi ; pedunculi breves, ramulis brevibus umbellas 3–6-floras gerentibus ; pedicelli clavati, circiter 5 mm. longi. *Perianthii* lobi dense ferrugineo-tomentosi, 3 exteriores breviores, intus pubescentes. *Stamina* minima, ordinum I et II villosa, vix 0·5 mm. longa, filamentis brevibus latis et connectivo obtuso; ordinis III 0·75 mm. longa, glandulis 2 minutis villosis ad basin ; ordinis IV staminodia ovata, villosa, inconspicua. *Ovarium* oblongum, in stylum gracilem attenuatum ; stigmate magno peltato. *Drupa* obovoideo-oblonga, 5–7 cm. longa, 2 cm. lata, saepe curvata, perianthii tubo et lobis persistentibus insidens, pedicello rugoso ; pericarpium rubrum, maculatum, apice rugosum.

Malay Peninsula. Perak : at Waterfall, Thaiping etc., *Wray*, 2268, 2701, 3452 ; on low ground near Larut, up to about 800 m., *King's Collector*, 1928, 3182, 4938, 6647, 7295.

Var. **glabrescens**, *Gamble*. *Paniculae* breves, pauciflorae, glabrae, cymulis haud prominenter umbellatis. *Staminum* ordinis III glandulae saepius nullae. *Folia* obovata vel elliptico-oblonga.

Malay Peninsula. Dindings : at Lumut, *Curtis*, 3445 (in Hbb. Singap. et Penang).

Notaphoebe reticulata, *Gamble* [Lauraceae-Cinnamomeae] ; *N. umbelliflorae*, Blume, affinis, paniculis ultra 15 cm. longis, drupa pustulata et foliis prominenter reticulatis differt.

Arbor parva, ad 12–15 m. alta, 15–25 cm. trunci diametro ; ramuli mediocriter crassi, pallide fusci. *Folia* chartacea, elliptico-obovata vel oblanceolata apice obtuse acuminata, basi cuneata utrinque glabra, lucida et prominenter reticulata; 12–22 cm. longa, 4–8 cm. lata ; costa gracilis ; nervi utrinque 8–12 curvati et prope marginem arcuatim juncti ; nervuli et reticulatio utrinque prominentes ; petiolus 1·5–3 cm. longus, gracilis. *Flores* parvi, secundi, in paniculas glabras patentes multifloras subterminales vel axillares ad 15–20 cm. longas dispositi ; cymulae subumbellatae ; pedicelli

graciles, clavati. *Perianthii* tubus brevis ; lobi ovati, acuti, exteriores 3 breviores. *Stamina* parva, ordinum I et II clavata, 1·5 mm. longa, antheris elongatis et filamentis villosis ; ordinis III paullo majora glandulis 2 rotundatis villosis ; ordinis IV staminodia parva, lanceolata, rubro-villosa. *Ovarium* ovoideum, in stylum gracilem attenuatum ; stigmate magno peltato. *Drupa* ovoidea vel ellipsoidea, 4 cm. longa, 2–3 cm. diametro, pedicello ampliato rugoso et perianthii tubo annulato insidens ; pericarpium crassum, fuscum, prominenter ferrugineo-pustulatum.

Malay Peninsula. Perak, *Scortechini* ; at Gunong Bubu, 1500 m., *Wray*, 3872 ; at Cottage, *Ridley*, 2967 ; in dense jungle on high mountains, at 1000–1200 m., *King's Collector*, 7002.

Notaphoebe sarawacensis, *Gamble* [Lauraceae-Cinnamomeae] ; species pulchra, *N. panduriformi*, Hook. f., affinis, foliis minoribus longe acuminatis, magis coriaceis et perianthio crassiore distincta.

Arbor parva. *Folia* coriacea, obovata vel panduriformia, apice longe obtuse acuminata, basi cordato-auriculata, supra nitida, glabra, siccitate nervis exceptis nigra, infra praeter costam et nervos puberulos glabra, ferruginea ; 12–16 cm. longa, 4–6 cm. lata ; costa crassa supra et infra prominens ; nervi laterales utrinque 10–12, supra profunde impressi, infra prominentes, marginem versus curvati et arcuati ; nervulis transversis conspicuis sicut nervi supra impressis inter se junctis ; petiolus subnullus vel brevissimus, haud 2–3 mm. longus. *Paniculae* ex axillis supremis ortae, multiflorae, 5–6 cm. longae, rhachis et ramuli fulvo-pubescentes ; bracteae parvae, ovato-acuminatae ; bracteolae minutae ; pedicelli clavati, glabrescentes, 3 mm. longi ; alabastra glabra, globosa. *Perianthii* tubus brevis ; lobi 6, exteriores 3 0·75 mm. longi, triangulares, crassi, interiores 3 ovato-cucullati, crassissimi, 1·25 mm. longi. *Stamina* minuta, filamentis brevissimis villosis ; antherae ordinis I et II oblongae, emarginatae, basi villosae ; ordinis III similes, glandulis 0 vel minutissimis ; staminodia ordinis IV triangularia, villosa. *Ovarium* ovatum, in stylo tenue attenuatum ; stigmate peltato. *Drupa* non visa.

Borneo. Sarawak : at Kuching, *Ridley*, (?) 1827 (Herb. Singap.).

Notaphoebe Havilandi, *Gamble* [Lauraceae-Cinnamomeae] ; *N. cuneatae*, Blume, affinis, sed foliis majoribus et inflorescentia glabra distincta.

Arbor parva, ad ripas fluminum prope mare crescens ; ramuli albi, cicatricibus magnis foliorum delapsorum notati. *Folia* coriacea, oblanceolata, apice cuspidato-acuminata, basi longe acuminata in petiolum decurrentia, supra glabra nitida, infra glabra ferruginea, 10–17 cm. longa, 4–5 cm. lata ; costa crassa, supra et infra prominens ; nervi laterales utrinque 8–12, in utroque latere prominentes, curvati et marginem versus inter se juncti ; petiolus crassus, albus, 5–7 mm. longus. *Paniculae* ex axillis foliorum vel foliorum delapsorum ortae, 3–4 cm. longae, glabrae ; bracteae minimae, ovatae ; pedicelli clavati, glabri, 3 mm. longi ; alabastra glabra, globosa. *Perianthii* tubus brevis ; lobi 6, exteriores 3 breviores vix 2 mm. longi. *Stamina* minuta, filamentis brevissimis villosis, antherae

ordinis I et II orbiculares, basi villosae. *Ovarium* ovatum, glabrum, in stylum crassum attenuatum ; stigmate peltato. *Drupa* non visa.

Borneo. Sarawak : tidal river banks at Kuching, *Haviland & Hose*, 3650.

Machilus Scortechinii, *Gamble* [Lauraceae-Cinnamomeae] ; foliis obovatis distincta, sed omnino *Machili* facie ; fructus autem et perianthii lobi fructiferi desunt.

Arbor, ad 12–15 m. alta, 40–50 cm. trunci diametro ; ramuli mediocriter crassi, fusci, ultimi minute ferrugineo-puberuli. *Folia* chartacea, obovata vel obovato-oblonga, apice breviter acuta, basi cuneata ; utrinque opaca, glabra ; 10–20 cm. longa, 4–7 cm. lata ; costa gracilis, supra sulcata ; nervi utrinque 8–10, supra paullo impressi, curvati et superiores prope marginem arcuatim juncti ; nervuli transversi irregulares, reticulatione sub lente prominenter areolata ; petiolus gracilis, glaber, 1–2 cm. longus, supra sulcatus. *Flores* parvi, lutei, in paniculas pedunculatas griseo-ferrugineas pubescentes, e foliorum vel foliorum delapsorum axillis ortas, 10–20 cm. longas, dispositi ; pedunculi longi, ramulis patentibus in dichasia triflora desinentibus ; pedicelli graciles, 2–3 mm. longi. *Perianthii* tubus brevissimus ; lobi subaequales, ovati, acuti, dense tomentosi, 2–3 mm. longi. *Stamina* gracilia, filamentis sericeo-pubescentibus, ordinum I et II 2 mm. longa, antheris ovato-obtusis ; ordinis III similia antheris oblongis et glandulis reniformibus stipitatis ; ordinis IV staminodia cordata, villoso-stipitata, 1 mm. longa. *Ovarium* oblongum, stylo gracili ; stigmate parvo obtuso. *Drupa* non visa.

Malay Peninsula. Perak, *Scortechini*, 492 ; on high mountains near Thaiping, at 1000–1500 m., *King's Collector*, 8413.

Phoebe Kunstleri, *Gamble* [Lauraceae-Cinnamomeae] ; *P. macrophyllae*, Blume, affinis, foliis subtus glaucis minute puberulis nec ferrugineo-tomentosis et paniculis minus pubescentibus differt.

Arbor, ad 25–30 m. alta, 60–90 cm. trunci diametro ; ramuli crassi, rugosi, lenticellis oblongis, ultimi fusco-puberuli. *Folia* coriacea, obovata vel elliptico-obovata, apice obtusa vel obtuse apiculata, basi attenuata, supra glabra, lucida, infra glaucescentia, minute puberula; 12–24 cm. longa, 6–11 cm. lata ; costa crassa, supra impressa ; nervi utrinque 8–12, supra impressi, ad marginem curvati et ibi gradatim arcuati ; nervuli transversi conspicui, distantes ; petiolus 1·5–4 cm. longus, paullo complanatus, puberulus. *Flores* pallide lutei, 10 mm. diametro in paniculas ferrugineo-puberulas longe-pedunculatas e foliorum ultimorum axillis ortas, 20 cm. longas dispositi ; pedunculi 10–12 cm. longi, ramis 5 cm. longis subcorymbosis ; cymulae 2–3-florae : pedicelli graciles, 5–6 mm. longi. *Perianthii* tubus brevis ; lobi ovati, acuti, exteriores 4 mm., interiores 5 mm. longi, utrinque tomentosi. *Stamina* gracilia, ordinum I et II antheris ellipticis et filamentis villosis 3 mm. longis ; ordinis III 3·5 mm. longa, antheris oblongis apice truncatis et glandulis 2 magnis reniformibus paullo supra basin filamentorum insertis ; ordinis IV staminodia cordata, glabra, stipitata, 2 mm. longa. *Ovarium* globosum, minute hirsutum, stylo gracili ; stigmate obtuso. *Drupa* ovoidea, 15 mm. longa, 10 mm. diametro, apice

truncata, perianthii lobis glabris insidens ; pericarpium siccitate nigrum, rugosum.

Malay Peninsula. Perak: near Goping up to 240 m., *Kunstler* (*King's Collector*), 4491, 6180, 8173 ; *Scortechini*, 497 ; *Wray*, 3964. Sungei Ujong, *Herb. Singap.* 2325. Singapore : at Pulan Ubri, *Ridley*, 5915.

Borneo, *Haviland.*

Phoebe Forbesii, *Gamble* [Lauraceae-Cinnamomeae] ; species insignis *P. macrophyllae*, Blume, affinis, foliis magis coriaceis pube nigrescenti-fulvo infra tectis, petiolis brevibus differt.

Arbor ; ramuli crassi, albidi, foliorum delapsorum cicatricibus et lenticellis conspicuis notati ; innovationes dense fulvo-tomentosae. *Folia* coriacea, ad apices ramulorum fasciculata, obovata vel oblanceolata, apice acuminata, basi cuneata vel attenuata, supra nitida, nigrescentia, costa excepta glabra, infra conspicue fulvo-tomentosa marginibus recurvis ; 15–25 cm. longa, 5–10 cm. lata ; costa crassa, supra tomentosa, infra prominens ; nervi utrinque 12–15, marginem versus arcuatim conjuncti, nervulis transversis multis conspicuis inter se juncti ; petioli breves, crassissimi, tomentosi, 5–10 mm. longi. *Paniculae* longe-pedunculatae, subcorymbosae, fulvo-tomentosae, in axillis foliorum supremis quasi fasciculatae, 10–15 cm. longae ; rami angulati in dichasia triflora desinentes ; flores aperti 10–12 mm. lati. *Perianthii* tubus brevis ; lobi subaequales, exteriores 5 mm. longi, interiores 6 mm., omnes ovati, acuti, densissime fulvo-tomentosi. *Stamina* gracilia, filamentis sericeo-villosis, ordinis I et II 3 mm. longa, antheris ellipticis obtusis ; ordinis III 3·5 mm. longa, antheris oblongis, glandulis 2 reniformibus supra tridentatis brevissime stipitatis paullo supra basin filamentorum insertis ; staminodia ordinis IV sagittata, acuminata, longe villoso-stipitata. *Ovarium* globosum, glabrum ; stylo tenui, stigmate parvo. *Bacca* ovoidea, truncata, 15 mm. longa, 10 mm. lata, ad basin perianthii lobis persistentibus incrassatis puberulis suffulta, siccitate purpureo-nigra, globosa.

New Guinea. *H. O. Forbes*, 215, 698, 805.

Stemmatodaphne, *Gamble* [Lauraceae-Cinnamomeae] genus novum *Notaphoebae* et *Phoebae* affinis ; huic accedit perianthii lobis persistentibus saepissime erectis, illi cymulis plus minus umbellatis ; etiam insignis est antheris triangularibus, glandulis minimis vel 0 et staminodiis sessilibus.

Arbores. *Folia* alterna, membranacea. *Flores* umbellati in paniculas laxas ex axillis foliorum ultimorum ortas dispositi ; pedicelli longi, conspicui. *Perianthii* lobi 6, subaequales, annulum prominentem ad basin intus gerentes. *Stamina* 9 fertilia, antheris 4-locularibus, ordinis I et II brevia, triangularia, filamentis brevissimis latis, introrsum spectantia ; ordinis III similia, extrorsum spectantia, glandulis 2 minutis ad basin filamenti aliquando 0 ; ordinis IV triangularia, sessilia. *Ovarium* globosum ; stylo brevi, stigmate parvo. *Drupa* magna, globosa, perianthii tubo persistente suffulta, perianthii lobis erectis vel paullo reflexis, pedicello clavato incrassato.—**Species unica.**

Stemmatodaphne perakensis, *Gamble* [Lauraceae-Cinnamomeae].

Arbor, ramis patentibus, ad 10–12 m. alta et 30–45 cm. trunci diametro ; ramuli mediocriter crassi, cortice griseo-albo. *Folia*

membranacea, obovata, apice longe acuminata, basi cuneata, attenuata vel paullo rotundata, utrinque glabra et supra saepe bullosa, siccitate nigra ; 12–30 cm. longa, 6–12 cm. lata ; costa crassa, supra complanata ; nervi utrinque 10–15, inaequaliter distantes, marginem versus curvati et ibi gradatim arcuati ; nervuli transversi graciles, paralleli, reticulatione obscura ; petiolus 1–5 cm. longus, glaber, sulcatus. *Flores* parvi, in paniculas laxas puberulas ad 10–12 cm. longas dispositi ; pedunculus 3–7 cm. longus ; rami 1–1·5 cm. longi, in cymulas 4–5-floras umbellatas desinentes ; pedicelli conspicui, rubri, puberuli, 10–15 mm. longi. *Perianthii* lobi subaequales, 1–2 mm. longi, annulo ad basin pubescente. *Stamina* triangularia, ordinum I et II 0·5–0·7 mm. longa ; ordinis III glandulis minutis vel 0 ; ordinis IV staminodia triangularia, 0·6 mm. longa, villosa. *Ovarium* ovoideo-globosum ; stylo brevi, conico, stigmate minuto. *Drupa* ad 6 cm. longa et 4–5 cm. diametro, globosa, pericarpio laevi.

Malay Peninsula. Perak : at Thaiping, *Wray*, 2658 ; at Kwala Dipong, *Scortechini*, 1793 ; Ulu Bubong and Larut Hills, up to 300 m., *King's Collector*, 3153, 6703, 10541. Malacca : at Batang Malacca, *Derry*, 203, 1157.

XXXIII.—DIAGNOSES AFRICANAE : XXXVII.

1111. **Achyranthes robusta**, *C. H. Wright*, in Dyer, Flor. Cap. vol. v. sect. i. p. 428 (anglice) [Amarantaceae-Amaranteae] ; *A. asperae*, Linn., affinis, foliis dense velutinis, bracteisque duplo longioribus differt.

Herba robusta. *Rami* costati, nodos incrassati, dense pubescentes. *Folia* late ovata vel fere orbicularia, 8 cm. longa, 5·5 cm. lata, utrinque dense velutina, crassa ; nervi subtus prominentes ; petiolus rigidus, supra canaliculatus, subtus convexus, 1·8 cm. longus. *Spicae* terminales, ad 25 cm. longae ; rhachis albo-lanata ; bracteae 6 mm. longae, lanceolatae, acuminatae, scariosae, ad basin marginesque lanatae, costa crassa ; bracteolae 3 mm. longae, ovatae, basi scariosae, albo-lanatae, costa crassa longe excurrente. *Perianthii* segmenta 4 mm. longa, late lanceolata, acuminata, glabra, 2 exteriores quam interiores paullo majores. *Stamina* 5 ; filamenta subulata ; antherae oblongae ; staminodia quam filamenta duplo breviora, quadrata, apice ciliata. *Ovarium* globosum ; stylus filiformis, perianthio aequilongus.

South Africa. Transvaal ; Batloaka Kraals, *Nelson*, 408 ; Natal : near Durban, 30 m., *Wood*, 7202, *Peddie* ; Inanda, 550 m., *Wood*, 4 ; without precise locality, *Gerrard*, 544.

1112. **Hermbstaedtia rubromarginata**, *C. H. Wright*, in Dyer, Flor. Cap. vol. v. sect. i. p. 408 (anglice), [Amarantaceae-Celosieae] ; *H. caffrae*, Moquin, affinis, ramis pilosis stylisque 4–5 differt.

Caulis lignosus ; rami leviter costati, pilosi, rubescentes. *Folia* oblanceolata, 12 mm. longa, 2–3 mm. lata, obtusa, basi attenuata, pilosa, rubromarginata. *Spicae* terminales, densiflorae, 3 cm. longae ; bracteae bracteolaeque 2 mm. longae, ovatae, concavae, scariosae. *Perianthii* segmenta dilute rosea, late ovata, 5 mm. longa, interiores quam exteriores paullo angustiora. *Filamenta*

subulata ; staminodia filamentis aequilonga, linearia, lobis 2 acutis. *Ovarium* ovoideum ; styli 4–5, breves ; ovula circa 6.

South Africa. Transvaal : Warmbath, *Miss Leendertz*, 1326.

1113. **Atriplex Bolusii**, *C. H. Wright*, in Dyer, Flor. Cap. vol. vi. sect. i. p. 443 (anglice) [Chenopodiaceae-Atripliceae] ; *A. leucocladae*, Boiss., affinis, bracteolis fructiferis majoribus sinuato-dentatis differt.

Caulis lignosus, subteres, dense albo-furfuraceus. *Folia* alterna, oblanceolata, apice rotundata, 12 mm. longa, 4 mm. lata, integerrima, carnosa, utrinque dense lepidota ; petiolus 6 mm. longus. *Florum* glomeruli spicatim dispositi ; bracteolae fructiferae rotundatae, 2 cm. diametro, liberae, sinuato-dentatae, furfuraceae, membranaceae, valide reticulatae. *Utriculus* membranaceus, pellucidus, 3 mm. diametro, compressus ; stylus brevis ; stigmata 2, 1·5 mm. longa. *Semen* erectum.

South Africa. Little Namaqualand : in sandy places near Port Nolloth, *Bolus*, 9457, *Pearson*, 509.

1114. **Protea Susannae**, *Phillips*, [Proteaceae-Proteeae], a *P. triandra*, Schlechter, stylis pubescentibus differt.

Rami tomentosi. *Folia* 4–13 cm. longa, 1–2·1 cm. lata, lanceolata vel oblongo-lanceolata, apice obtusa, basi angustata, distincte nervosa, juniora pubescentia vel tomentosa, demum glabra. *Capitulum* sessile, 9·5 cm. longum, circiter 7·5 cm. latum. *Involucri bracteae* 9-seriatae ; exteriores ovatae, obtusae, tomentosae, demum glabrescentes ; interiores oblongae, concavae, infra tomentosae, calyci aequales vel breviores. *Calycis tubus* 5·5 cm. longus, basi dilatus, 7-nervosus, supra dense villosus ; laminae 2 cm. longae, villosae ; laminae connexae apice triaristatae ; aristae laterales 6 mm. longae, teretes, villosae, nigro-ciliatae ; media 4 mm. longa, filiformis. *Stamina* fertilia subsessilia, 5 mm. longa, linearia, apice glandibus 1·5 mm. longis lanceolatis obtusis instructa ; stamen sterile lineare, acutum, eglandulosum. *Stylus* 6·5 cm. longus, teres, basi distincte carinatus, pubescens. *Stigma* 5 mm. longum, oblongo-lineare, apice subacutum, tumidum, recurvum, basi prominenter sinuosum. *Ovarium* 3 mm. longum, obovato-oblongum, pilis flavis longis vestitum.

South Africa. Bredasdorp Div. : Elim, *Schlechter*, 7718 ; Riversdale, *Muir in Herb. Galpin*, 5305.

1115. **Protea ignota**, *Phillips* [Proteaceae-Proteeae] ; a *P. ligulaefolia*, Sweet, forma capituli et bracteis involucri apicibus nigris differt.

Rami glabri. *Folia* 15 cm. longa vel ultra, 6–8 mm. lata, linearioblonga, apice subacuta, basi attenuata, glabra. *Capitulum* sessile. *Involucri bracteae* 7-seriatae ; exteriores ovatae, apice obtusae, nigrae ; interiores oblongae vel lineari-oblongae, calyci aequales. *Calycis tubus* lanato-hirsutus ; laminae connexae apice triaristatae ; aristae longae, dense ciliatae. *Stylus* 5 cm. longus, teres, compressus, albo-villosus. *Stigma* apice acutum, basi curvatum.—*P. longifolia*, Ker-Gawl. in Bot. Reg. t. 47 ; Meisn. in DC. Prodr. xiv. 238 (partly).

Known only from the figure in the Botanical Register ; it is allied to *P. ligulaefolia*, Sweet, figured in Andr. Bot. Repos. t. 133 under the name of *P. longifolia*, var. *ferruginoso-purpurea*.

1116. **Protea Pegleri,** *Phillips* [Proteaceae-Proteeae] ; a *P. grandiflora*, Thunb., capitulis lateralibus differt.

Frutex 2–2·5 m. altus. *Rami* glabri, cortice griseo. *Folia* 12·5 cm. longa, 6–8 mm. lata, falcata, lanceolato-oblonga, apice subacuta, basi angustata, costata, glabra. *Capitula* apice ramorum conferta, subsessilia, 7 cm. longa, circiter 6·5 cm. lata ; juniora globosa. *Involucri bracteae* 17-seriatae ; exteriores ovatae, subacuminatae, apice obtusae vel subacutae, nigrae, basi minute tomentosae ; interiores oblongae vel spathulato-oblongae, apice incurvae, calyci longiores. *Calycis tubus* 3·2 cm. longus, basi dilatatus, 7-nervosus, medio pilosus, ciliatus ; laminae 1·1 cm. longae, glabrae vel sparse ciliatae ; laminae connexae apice tridentatae ; dentes subaequales. *Stamina* omnia fertilia, subsessilia, 8 mm. longa, linearia, apice glandibus 0·25 mm. longis ovatis instructa. *Stylus* 3·8 cm. longus, teres, basi sulcatus, supra ovarium ventricosus, glaber. *Stigma* 8 mm. longum, apice subacutum, sulcatum, basi leviter sinuosum. *Ovarium* 2 mm. longum, obovatum, pilis longis vestitum.

South Africa. Transkei : Kentani, grassy slopes and valleys, shrubby, 2–6 feet, *Miss A. Pegler*, 274.

Allied to *P. grandiflora*, Thunb., from which it differs in the capitula being aggregated at the ends of the branches ; other differences are found in the floral characters.

1117. **Protea trigona,** *Phillips.*[Proteaceae-Proteeae]; a *P. grandiflora*, Thunb., stylo infra ventricosa et stigmate acuto differt.

Rami glabra. *Folia* 5·5–11·5 cm. longa, 1·9–2·5 cm. lata, oblongo-lanceolata vel obovato-lanceolata, apice obtusa, basi leviter angustata, distincte venosa, subtus minute canescens vel glabra. *Capitulum* subsessile, 6·5 cm. longum, circiter 7·5 cm. latum ; receptaculum leviter concavum. *Involucri bracteae* 9–11-seriatae ; exteriores ovatae, subacuminatae, apice obtusae, infra dense lano-ciliatae ; interiores oblongae, concavae, albo-pubescentes, calyci breviores. *Calycis tubus* 3·2 cm. longus, basi dilatatus, 7-nervosus, extus pilosus ; laminae 1·7 cm. longae dense villosae ; dentes subaequales 2 mm. longi, ovati, acuminati. *Stamina* omnia fertilia, sessilia, 1 cm. longa, linearia, apice glandibus 0·5 mm. longis ovatis obtusis vel ovalibus instructa. *Stylus* 4 cm. longus, teres, supra trigonus, sulcatus, supra ovarium ventricosus, glaber. *Stigma* 1 cm. longum, filiforme, apice acutum, basi leviter tumidum. *Ovarium* 4 mm. longum, ellipticum, pilis longis subflavis vestitum. *Squamae* hypogynae 1·5 mm. longae, ovatae, subacutae.

South Africa. Transvaal : Derde Poort, near Pretoria, *Leendertz*, 679.

Approaches *P. grandiflora*, Thunb., but differs principally in the shape of the leaves and in the dentation and nervation of the cohering calyx segments.

1118. **Protea multibracteata,** *Phillips* [Proteaceae-Proteeae]; a *P. grandiflora*, Thunb., calycis laminis non villosis differt.

Rami glabri. *Folia* 4–12·8 cm. longa, 1·3–1·5 cm. lata, lanceolata vel oblongo-lanceolata, apice subobtusa, basi angustata, plus minusve distincte venosa. *Capitulum* pedunculatum, 6·3–7·7 cm. longum, circiter 5·3 cm. latum ; pedunculus 1–2 cm. longus. *Involucri*

bracteae 18–20 seriatae ; exteriores ovatae, subacuminatae, apice obtusae, subtiliter tomentosae; interiores oblongae vel spathulato-oblongae, calyci subaequales. *Calycis tubus* 4 cm. longus, membranaceus, basi dilatatus, 7-nervosus, intus dense pilosus ; laminae 1·3 cm. longae, glabrae vel pilosae ; laminae connexae apice tridentatae, ciliatae, interdum eciliatae ; dentes subaequales, 1–1·5 mm. longi. *Stamina* omnia fertilia, subsessilia, 1 cm. longa, linearia, apice glandibus 0·3 mm. longis ovatis obtusis instructa. *Stylus* 4 cm. longus, teres, leviter compressus, sulcatus, supra ovarium leviter dilatatus. *Stigma* 1 cm. longum, filiforme, apice obtusum, basi vix sinuosum. *Ovarium* 3 mm. longum, obovatum, pilis longis vestitum.

South Africa. Orange Free State, *Cooper*, 951 ; Drakensberg, *Cooper*, 951 ; Transkei, *Baur*, 721 (partly) ; British Kaffraria, *Cooper*, 86.

1119. **Protea natalensis**, *Phillips* [Proteaceae-Proteeae]; a *P. multi-bracteata*, Phillips, designatione bractearum capituli differt.

Rami glabri. *Folia* 7·5–11·5 cm. longa, 1·1–1·4 cm. lata, lanceolato-oblonga, apice obtusa, basi angustata, costata, glabra. *Capitulum* pedunculatum, 6·5 cm. longum, circiter 7·5 cm. latum. *Involucri bracteae* 10–12 seriatae ; exteriores ovatae, subacuminatae, apice acutae vel obtusae ; extimae tomentosae ; interiores oblongae vel spathulato-oblongae, calyci aequales. *Calycis tubus* 3·2 cm. longus, membranaceus, basi dilatatus, 7-nervosus, glaber vel intus pilosus ; laminae 1·3 cm. longae, glabrae ; laminae connexae apice tridentatae, ciliatae ; dentes subaequales, 1 mm. longi. *Stamina* omnia fertilia, subsessilia, 11 mm. longa, linearia, apice glandibus 0·3 mm. longis ovatis tumidis instructa. *Stylus* 3·8 cm. longus, leviter compressus, trigonus, supra ovarium ventricosus, glaber. *Stigma* 11 mm. longum, sulcatum, apice obtusum, basi sinuosum. *Ovarium* 4 mm. longum, oblongum, pilis longis vestitum.—*P. grandiflora*, Thunb., var. *angustifolia*, Klotzsch in Flora, 1845, 75 ; Klotzsch in Beitr. zu Fl. des Cap. und Natal, 139.

South Africa. Natal: between the Umlaas River and Durban, *Krauss*, 176.

1120. **Protea Bolusii**, *Phillips* [Proteaceae-Proteeae]; a *P. rhodantha*, Hook. fil., designatione bractearum capituli differt.

Rami glabri. *Folia* 3·5–13 cm. longa, 1·3–2·5 cm. lata, lanceolata, apice subacuta, basi angustata, costata distincte venosa, glabra. *Capitulum* subsessile, 7 cm. longum, 6·5 cm. latum ; receptaculum planum. *Involucri bracteae* 12-seriatae ; extimae apice nigrae ; exteriores ovatae, subacuminatae, subobtusae, glabrae ; interiores oblongae, incurvae, glabrae, calyci longiores. *Calycis tubus* 2·8 cm. longus, membranaceus, basi dilatatus, 7-nervosus, ciliatus, intus pilosus, basi glaber ; laminae 1 cm. longae, glabrae ; laminae connexae apice tridentatae, aliquando sparse ciliatae ; dentes subaequales, 1 mm. longi. *Stamina* omnia fertilia, subsessilia, 7 mm. longa, linearia, apice glandibus 0·25 mm. longis ovatis obtusis instructa ; fila 0·5 mm. longa, dilatata, concava. *Stylus* 3·7 cm. longus, teres, sulcatus, supra ovarium ventricosus, glaber. *Stigma* 7 mm. longum, obtusum, basi vix sinuosum. *Ovarium* 3 mm. longum, obovato-oblongum, pilis subflavis vestitum.

South Africa. Swaziland: between Dalriach and Forbes' Reef, *Bolus*, 12265.

This species approaches *P. rhodantha*, Hook. fil., but differs in having a larger head with different phyllotaxy, involucral bracts quite glabrous and not ciliate. The venation of the leaf is more marked.

1121. **Protea Flanaganii**, *Phillips* [Proteaceae-Proteeae]; a *P. Baurii*, Phillips, capitulo erecto designationeque involucri bractearum differt.

Rami glabri. *Folia* 9–13 cm. longa, aliquando 4 cm. longa, supra 0·7–1·5 cm. lata, basi 1·5–3 mm. lata, lanceolato-oblonga vel oblonga, apice acuta vel obtusa, basi angustata vel attenuata. *Capitulum* sessile, 5·7 cm. longum, circiter 7 cm. latum. *Involucri bracteae* 8–10-seriatae; exteriores ovatae, apice obtusae, infra pubescentes, marginibus membranaceis; interiores oblongae, vel spathulato-oblongae, calyci longiores. *Calycis tubus* 2·5–3 cm. longus, basi dilatatus, 7-nervosus, ciliatus, glaber; laminae 1·1 cm. longae, pilis rigidis paucis vestitae vel glabrae; laminae connexae apice tridentatae; dentes laterales 1·5 mm. longi, oblongi, ciliati; medius 1 mm. longus, ovatus, acuminatus. *Stamina* omnia fertilia, sessilia, 0·8–1 cm. longa, linearia, apice glandibus 1 mm. longis ovalibus obtusis tumidis instructa. *Stylus* 3·2 cm. longus, teres, trigonus, supra ovarium compressus, demum globosus, glaber. *Stigma* 0·8–1 cm. longum, apice obtusum, basi vix sinuosum. *Ovarium* 4 mm. longum, obovato-oblongum, pilis longis vestitum.

South Africa. Gwenkala River, *Flanagan*, 804; Transkei: Kentani, *Miss A. Pegler in Albany Museum*, 274.

The material of Pegler, 274, consisted of a barren shoot and a detached capitulum. The smaller leaf measurements refer to the leaves of the barren shoot.

1122. **Protea Baurii**, *Phillips* [Proteaceae-Proteeae]; a *P. simplice*, Phillips, capitulo subpendulo pedunculato differt.

Rami glabri. *Folia* 9·5–11·5 cm. longa, 0·9–1·1 cm. lata, oblongo-lanceolata, apice acuta vel sub-obtusa, basi angustata, distincte nervosa, glabra. *Capitulum* pedunculatum, 6·5 cm. longum, circiter 6 cm. latum; pedunculus 1·2 cm. longus, curvatus. *Involucri bracteae* 14-seriatae; bracteae pedunculi concavae, ciliatae, pubescentes; exteriores ovatae, apice obtusae; interiores concavae, oblongae, calyci subaequales. *Calycis tubus* 3·2 cm. longus, basi dilatatus, 7-nervosus, membranaceus, dense pilosus; laminae 11 mm. longae, supra ciliatae, interdum glabrae; laminae connexae apice tridentatae: dentes subaequales, 1–2 mm. longi. *Stamina* omnia fertilia, subsessilia, 7 mm. longa, linearia, apice glandibus oblongis 0·5 mm. longis instructa. *Stylus* 3·8 cm. longus, teres, supra ovarium compressus, glaber. *Stigma* 7 mm. longum, filiforme, apice obtusum, basi vix sinuosum. *Ovarium* 3 mm. longum, obovatum, pilis longis vestitum.

South Africa. Transkei, *Baur*, 721 (partly).

1123. **Protea simplex**, *Phillips* [Proteaceae-Proteeae]; a *P. Flanaganii*, Phillips, designatione bractearum capituli styloque breviore differt.

Rami glabri. *Folia* 5–9 cm. longa, 0·7–1·7 cm. lata, lanceolata vel lanceolato-oblonga, apice acuta vel subacuta, basi angustata, costata,

indistincte nervosa, glabra. *Capitulum* sessile, 4 cm. longum, circiter 4 cm. latum. *Involucri bracteae* 6-seriatae, glabrae vel extimae quandoque subtiliter pubescentes; exteriores ovatae, acuminatae, obtusae; interiores oblongae, calyci aequales. *Calycis tubus* 2 cm. longus, membranaceus, basi dilatatus, 7-nervosus, in medio pilosus; laminae 1·2 cm. longae, supra pilosae; laminae connexae apice tridentatae; dentes laterales 1·5 mm. longi; medius 1 mm. longus, ovatus, acuminatus. *Stamina* omnia fertilia, subsessilia, 6 mm. longa, linearia, apice glandibus ovatis obtusis tumidis instructa. *Stylus* 2·2 cm. longus, teres, supra ovarium globosus. *Stigma* 6 mm. longum, obtusum, stylum passim attenuatum vix basi sinuosum. *Ovarium* 5 mm. longum, oblongum, pilis longis vestitum.

South Africa. Swaziland, *Burtt-Davy*, 2767; Natal, *Gerrard*, 721; *Sutherland;* Transkei, *Baur*, 608.

1124. **Protea undulata**, *Phillips* [Proteaceae-Proteeae]; a *P. Flanaganii*, Phillips, bracteis involucri distincte ciliatis ramis tomentosis differt.

Rami apice tomentosi demum glabri. *Folia* 7·5–15 cm. longa, 11–18 mm. lata, oblonga vel lineari-oblonga, apice subacuta, basi attenuata, distincte nervosa, glabra. *Capitulum* sessile, 4 cm. longum, circiter 4 cm. latum, globosum. *Involucri bracteae* 8-seriatae, minute ciliatae, pubescentes; exteriores ovales, apice obtusae; interiores oblongo-spathulatae, apice incurvae, calyce paullo longiores. *Calycis tubus* 2 cm. longus, membranaceus, basi dilatatus, glaber, marginibus undulatis; laminae 1 cm. longae, glabrae; laminae connexae apice tridentatae, ciliatae; dentes laterales 2 mm. longi, oblongo-lineares; dens medius 1 mm. longus. *Stamina* omnia fertilia, subsessilia, 5 mm. longa, linearia, apice glandibus 1·5 mm longis ovalibus obtusis instructa. *Stylus* 2·2 cm. longus, teres, leviter compressus, supra ovarium dilatus, ventricosus. *Stigma* 5 mm. longum, lineare, apice obtusum, basi leviter geniculatum *Ovarium* 3 mm. longum, oblongo-obovatum, pubescens, pilis rufis longis vestitum.

South Africa. Described from a specimen without collector's name or locality preserved in the Kew Herbarium.

Allied to *P. Flanaganii*, Phillips, but differs in the shape of the capitulum, the tomentose branches and the distinctly ciliate involucral bracts.

1125. **Protea Marlothii**, *Phillips* [Proteaceae-Proteeae]; a *P. effusa*, E. Mey., foliis longioribus, et *P. pendula*, R. Br., et *P. sulphurea*, Phillips, capitulis erectis differt.

Rami glabri. *Folia* 5·7–7·8 cm. longa, 0·7–1·5 cm. lata, lanceolata, apice acuta, mucronata, basi angustata, glabra. *Capitulum* sessile, 7·5 cm. longum, circiter 9 cm. latum; receptaculum 2 cm. altum, convexum. *Involucri bracteae* 13-seriatae, glabrae; exteriores orbiculato-ovatae, obtusae, marginibus membranaceis; interiores oblongae, calyci breviores. *Calycis tubus* 2 cm. longus, basi dilatatus, 5-nervosus, supra setosus, cetera glaber; laminae 7 mm. longae, setosae; laminae connexae apice tridentatae; dentes subaequales 0·5 mm. longi. *Stamnia* omnia fertilia, subsessilia, 5 mm. longa, linearia, apice glandibus 0·5 mm. longis ovatis obtusis instructa. *Stylus* 2·8 cm. longus, curvatus, basi compressus, glaber. *Stigma* 5 mm.

longum, sulcatum, obtusum, basi in stylum attenuatum. *Ovarium* 3 mm. longum, obovatum, pilis longis subflavis vestitum. *Squamae* hypogynae 1·5 mm. longae, 0·75 mm. latae, ovales, obtusae.

South Africa. Worcester Div.: Matroosberg, *Marloth*.

1126. **Protea sulphurea**, *Phillips* [Proteaceae-Proteeae]; a *P. effusa*, E. Mey., receptaculo conico et a *P. pendula*, R. Br., foliis brevioribus nervis indistinctis differt.

Frutex depressus, 2 m. altus. *Folia* 2·2–3 cm. longa, 0·8–1·3 cm. lata, obovato-cuneata vel lanceolata, apice subacuta, mucronata, basi angustata, minute glandulosa, indistincte nervosa, flava demum pallida, glabra. *Capitulum* subsessile, pendulum, 6·5 cm. longum, circiter 7·5 cm. latum; receptaculum conicum, 2·5 cm. altum. *Involucri bracteae* 9–10-seriatae, glabrae; exteriores ovatae, apice subacutae, minute ciliatae; interiores oblongae vel spathulato-oblongae, calyci longiores. *Calycis tubus* 2·3 cm. longus, basi dilatatus, 6–7-nervosus, supra setosus, cetera glaber; laminae sparse setosae; laminae connexae apice tridentatae, leviter recurvae; dentes laterales 1·5 mm. longi; dens medius 1 mm. longus. *Stamina* omnia fertilia, subsessilia, 5 mm. longa, linearia, apice glandibus 0·25 mm. longis ovatis acutis instructa. *Stylus* 3·2 cm. longus, curvatus, supra ovarium compressus, falcatus. *Stigma* 5 mm. longum, sulcatum, apice obtusum, basi in stylum attenuatum. *Ovarium* pilis longis subflavis vestitum. *Squamae* hypogynae 1·5 mm. longae, lineares, apice obtusae.

South Africa. Laingsburg Div.: Witteberg Range; near Matjesfontein, *Marloth*, 3208; *Pearson*.

1127. **Protea witzenbergiana**, *Phillips* [Proteaceae-Proteae]: a *P. pityphylla*, Phillips, foliis brevioribus et *P. pendula*, R. Br., caudicibus longis apice bractearum involucri differt.

Rami villosi. *Folia* 2–3 cm. longa, 1–1·5 mm. lata, filiformia, acuta, mucronata, supra sulcata, subtus convexa, minute punctata, glabra vel sparse pilosa. *Capitulum* junius subglobosum, obtusum; senius 5 cm. longum, circiter 5 cm. latum. *Involucri bracteae* 9–10-seriatae, glabrae; exteriores in aciem foliosum longum productae; interiores oblongae, leviter convexae, calyci longiores. *Calycis tubus* 1·5 cm. longus, basi dilatatus, 5-nervosus, supra ciliatus, pilosus, cetera glaber; laminae 7 mm. longae, sparse setosae vel glabrae. *Stamina* omnia fertilia, subsessilia, 3 mm. longa, linearia, apice glandibus 0·3 mm. longis ovatis acutis instructa. *Stylus* 2 cm. longus, curvatus, supra ovarium falcatus, inflatus, glaber. *Stigma* 3 mm. longum, sulcatum, obtusum, basi in stylum attenuatum. *Ovarium* obovato-oblongum, pilis longis rufis vestitum.

South Africa. Tulbagh and Ceres Div.: Witzenberg Range, *Zeyher*, 3687; *Burchell*, 8676.

1128. **Protea pityphylla**, *Phillips* [Proteaceae - Proteeae]; a *P. rosacea*, Linn., bracteis extimis foliosis aciebus productis, et a *P. witzenbergiana*, Phillips, foliis longis capitulisque majoribus differt.

Rami glabri. *Folia* 6·5–7·9 cm. longa, 1 mm. lata, linearia, apice acuta, mucronata, supra sulcata. *Capitulum* 4–4·5 cm. longum, 6·5 cm. latum. *Involucri bracteae* 7-seriatae, glabrae; exteriores ovatae, acuminatae, obtusae vel acutae; extimae in aciem foliosum

longum productae ; interiores oblongae, leviter concavae, calyci longiores. *Calycis tubus* 1·7 cm. longus, basi dilatatus, 7-nervosus, supra setosus, cetera glaber ; laminae 6 mm. longae, infra setosae ; laminae connexae apice tridentatae; dentes subaequales 0·5 mm. longi. *Stamina* omnia fertilia, subsessilia, 4 mm. longa, oblongo-linearia, apice glandibus 0·3 mm. longis ovatis subacutis instructa. *Stylus* 2·4 cm. longus, teres, compressus, supra ovarium dilatus, falcatus, glaber. *Stigma* 4 mm. longum, obtusum, basi in stylum attenuatum, vix sinuosum. *Ovarium* 2 mm. longum, obovato-oblongum, pilis longis rufis vestitum. *Squamae* hypogynae 1 mm. longae, ovato-oblongae, obtusae.

South Africa. Ceres Div.: Mitchells Pass, *MacOwan*, 2907 ; *MacOwan in Herb. Norm. Austro-Afric.*, 913 ; *Bodkin in Herb. Bolus*, 6089.

1129. **Protea Zeyheri**, *Phillips* [Proteaceae-Proteeae]; a *P. acaule*, Thunb., basi stylo inflato, foliorum nervis indistinctis differt.

Suffrutex acaulescens. *Folia* 8–9·5 cm. longa, 3·8–7·7 cm. lata, lineari-lanceolata, basi passim angustata, apice acuta vel subacuta, indistincte venosa, glabra. *Capitulum* subsessile, 2·5 cm. longum, circiter 3 cm. latum. *Involucri bracteae* 12-seriatae, glabrae ; exteriores ovatae, subacuminatae, apice obtusae, ciliatae ; interiores patulae, lineari-spathulatae, supra ciliatae. *Calycis tubus* 1·5 cm. longus, basi dilatatus, 7-nervosus, supra 1 mm. latus, ciliatus, glaber ; laminae 3 mm. longae, infra hirsutae ; laminae connexae apice tridentatae, ciliatae ; dentes subaequales, 0·5 mm. longi. *Stamina* omnia fertilia, subsessilia, 2 mm. longa, linearia, apice glandibus 0·25 mm. longis instructa. *Stylus* 2·2 cm. longus, basi inflatus. *Stigma* 2 mm. longum, sulcatum, basi leviter nodulosum. *Ovarium* 3 mm. longum, pilis longis rufis vestitum.

South Africa. Tulbagh Div. : Paarde Kloof, Witzenberg Range, *Zeyher*, 1460.

1130. **Protea convexa**, *Phillips* [Proteaceae-Proteeae]; a *P. acaule*, Thunb., receptaculo convexo differt.

Suffrutex acaulescens. *Folia* 23 cm. longa, 5–9 cm. lata, obovato-spathulata, obtusa, mucrone obtuso, venis prominentibus, glauca, glabra. *Capitulum* sessile, 5 cm. longum, 8 cm. latum ; receptaculum 2 cm. altum, convexum ; palae ovatae, subacuminatae, apice subacutae. *Involucri bracteae* 10–12-seriatae ; exteriores ellipticiovatae, apice obtusae, ciliatae, glabrae ; interiores spathulato-oblongae vel spathulato-lineares, glabrae vel minute pubescentes. *Calycis tubus* 2·2 cm. longus, basi dilatatus saepissime 9-venosus, supra pubescens vel glaber; laminae 8 mm. longae, pubescentes, supra villosae ; laminae connexae apice tridentatae ; dentes subaequales, 1 mm. longi, ciliati. *Stamina* omnia fertilia, 5 mm. longa, oblongo-linearia, apice glandibus 0·5 mm. longis ovatis obtusis instructa. *Stylus* 4 cm. longus, curvatus, infra compressus, supra ovarium articulatus, glaber. *Stigma* 3 mm. longum, sulcatum, apice obtusum, basi leviter nodulosum. *Ovarium* 8 mm. longum, obovato-oblongum, pilis aureis longis vestitum.

South Africa. Worcester Div. : on plains near Matjesfontein, *Marloth*, 3209.

This species approaches *P. acaulis*, Thunb., var. *obovata*, Phillips, but differs in having larger glaucous leaves, a larger head, and a hemispherical receptacle.

1131. **Protea asper**, *Phillips* [Proteaceae-Proteeae]; a *P. scabra*, R. Br., capitulis majoribus differt.

Suffrutex acaulescens. *Folia* 11·5–15·5 cm. longa, 3–6 mm. lata, recta vel falcata, lineari-oblonga, apice obtusa, mucronata, basi angustata, aspera, glabra vel sparse pilosa. *Capitulum* subsessile, 7·5-8·5 cm. longum, circiter 5 cm. latum. *Involucri bracteae* 9-seriatae, pubescentes, ciliatae; exteriores ovatae, obtusae; interiores oblongae vel spathulato-oblongae, calyci breviores. *Calycis tubus* 5 cm. longus, basi dilatatus, 7-nervosus, dense pilosus; laminae 1·3 cm. longae, ciliatae, dense hirsutae; laminae connexae apice tri-aristatae; aristae ovatae, acuminatae, albo-lanatae, sparse pilis nigris vestitae; aristae laterales 4 mm. longae; arista media 2 mm. longa. *Stamina* omnia fertilia, subsessilia, 8 mm. longa, apice glandibus 0·6 mm. longis ovatis acutis vel ovato-oblongis subacutis instructa; filamenta 0·5 mm. longa, tumida, dilatata, sulcata. *Stylus* 5 cm. longus, teres, sulcatus, infra trigonus, pubescens. *Stigma* 8 mm. longum, apice subobtusum, sulcatum. *Ovarium* 4 mm. longum, oblongo-ovatum, pilis longis rufis vestitum.

South Africa. Bredasdorp District, *Bolus*, 7861.

1132. **Protea scabriuscula**, *Phillips* [Proteaceae-Proteeae]; a *P. Scolopendrio*, R. Br., foliis angustatis et capitulis minoribus differt.

Suffrutex acaulescens. *Folia* 25 cm. longa, 0·7–1·4 cm. lata, lanceolata, apice acuta, basi attenuata, marginibus undulatis, aspera, glabra vel aliquando subtus pilosa. *Capitulum* subsessile, 6·5 cm. longum, circiter 4·5 cm. latum. *Involucri bracteae* 6-seriatae, lanceolatae, acuminatae, acutae, dense tomentosae demum glabrae; interiores calyci breviores. *Calycis tubus* 2·5 cm. longus, basi dilatatus, 7-nervosus, dense ciliatus, pilosus; laminae 7 mm. longae, ciliatae; laminae connexae apice tridentatae, ciliatae; dentes laterales 1 mm. longi; dens medius 0·4 mm. longus. *Staminia* subsessilia, 4 mm. longa, linearia, apice glandibus 1 mm. longis oblongis apice obtusis instructa. *Stylus* 3 cm. longus, teres, supra ovarium inflatus, glaber sed infra pubescens. *Stigma* 5 mm. longum, sulcatum, apice obtusum, minute compressum, basi leviter sinuosum. *Ovarium* 3 mm. longum, oblongum, pilis longis albis vestitum.

P. Scolopendrium, R. Br., var. *scabriuscula*, Meisn. in DC., Prodr. xiv., 243.

South Africa. Ceres Div.: Gydouw, *Bolus*, 7557; *Schlechter*, 10,000.

1133. **Protea decurrens**, *Phillips* [Proteaceae-Proteeae]; a *P. humiflora*, Andr., foliis angustis decurrentibus et a *P. acerosa*, R. Br., calycis laminarum forma differt.

Suffrutex acaulis. *Rami* erecti, glabri. *Folia* 3·2–5·7 cm. longa, 1·3 mm. lata, linearia, apice acuta, decurrentia, glabra. *Capitula* conferta, lateralia, pedunculata, 4 cm. longa, circiter 1·5 cm. lata. *Involucri bracteae* 9–10-seriatae, dense hirsutae vel villosae; exteriores ovatae, obtusae; interiores oblongae vel spathulato-oblongae, apice dense albo-hirsutae, ciliatae, calyci longiores.

Calycis tubus 2 cm. longus, infra dilatatus, 7-nervosus, glaber ; laminae 5 mm. longae, oblongo-ellipticae, glabrae ; laminae connexae apice tridentatae, minute ciliatae ; dentes subaequales, 0·5 mm. longi. *Stamina* omnia fertilia, subsessilia, 3 mm. longa, linearia, apice glandibus 0·25 mm. longis ovatis instructa ; filamenta 0·3 mm. longa. *Stylus* 2·3 cm. longus, curvatus, teres, infra compressus, supra ovarium in carinam productus. *Stigma* 3 mm. longum, sulcatum, apice tumidum. *Ovarium* 4 mm. longum, obovatum, pilis longis vestitum.

South Africa. Swellendam Div.: Langeberg Range, *Bolus in Herb. Norm. Austro-Afric.*, 1348 ; Swellendam Div.: mountains near Puspas Valley, Voormansbosch, Duivel's Bosch, *Zeyher*, 3676 ; Knysna Div.: by the Keurboom River, *Zeyher*, 3676 ; without precise locality, *Drummond*.

1134. **Penaea dubia**, *E. L. Stephens* [Penaeaceae] ; versimiliter *P. ericifoliae*, Gilg, affinis sed habitu *P. ovatae*, Eckl. et Zeyh., et quoad inflorescentiam et flores *P. fruticulosae*, Linn. f., similis.

Suffrutex, ramis minute scabris. *Folia* sessilia, ovata vel elliptica, acuta vel mucronato-acuta, 5–7 mm. longa, 3–4 mm. lata, exstipulata ; setulis brevissimis 1–2 utrinque intra axillam instructis. *Flores* laterales, subsessiles, in axillis bractearum foliacearum dispositi ; bracteolae 4, decussatae, integrae, 5 mm. longae, 3 mm. latae, persistentes vel deciduae, setulis intra axillam instructae, bracteolae duae inferiores semicoriaceae, concavae, oblongo acutae, mucronatae, duae superiores scariosae, ovatae, acuminato-acutae. *Perianthium* persistens, in fructu tantum notum ; tubus cylindrico-ovatus, obscure 8-sulcatus, 6 mm. longus ; segmenta ad trientem erecta, deinde reflexa, deltoidea, acuta, 2 mm. longa. *Staminum* filamenta (in fructu) brevissima. *Ovarium* in fructu parce scabridum ; stylus scaber, tuberculis minutis, filiformis ; fastigiis 4 parvis obscuris ovarii loculis alternantibus, basi designatis ; stigma ignotum.

South Africa. Cape Colony : without locality, *Roxburgh* (in herb. Delessert).

The affinities of this species are doubtful, the solitary specimen being in the fruiting stage and showing neither the stamens nor the upper half of the style. Its general habit is that of a small-leaved *P. ovata*, but in the inflorescence and bracts it resembles *P. fruticulosa*. Its perianth is that of *P. ericifolia*, and the projections at the base of the style may correspond to the more definite ridges at the base of the style in that species, to which it is probably most nearly allied.

1135. **Thesium tetragonum**, *A. W. Hill* [Santalaceae] ; *T. unyikensi*, Engl., affine sed caulibus non sulcatis bracteolis glabris et fructibus praecipue differt.

Herba perennis ; caules erecti, 15–18 cm. alti, plus minusve quadrangulares, glabri, paullo vel non sulcati. *Folia* prope basin triangulari-ovata, acuta, squamiformia, 3 mm. longa, superne bracteae ovato-lanceolatae, acutae, 2–3 mm. longae. *Flores* in cymulas breves axillares irregulariter dispositi ; pedunculus 0·65–10 mm. longus, nudus, ebracteatus, bracteolae numerosae involucrum

formantes. *Perianthium* 2·25–2·5 mm. longum; segmentis 1–1·2 mm. longis ovato-lanceolatis cucullatis marginibus inflexis membranaceis medio paullo papillosis. *Antherae* subsessiles, 0·5 mm. longae. *Stylus* circiter 2 mm. longus. *Fructus* 3 mm. longus, 2·5 mm. latus, globoso-ovoideus, costis 10 vel pluris conspicuis latis, costis intermediis saepius divisis.

ANGOLA. *Gossweiler*, 4209 A.

1136. **Thesium triste**, *A. W. Hill* [Santalaceae]; species *T. viridi*, A. W. Hill, similis sed glabra et foliis ovato-lanceolatis floribusque majoribus distincta.

Suffrutex perennis, rhizomate lignoso; caules erecti, tenaces, glabri, ad basin squamis dense imbricatis obtecti, squamae late ovatae, acutae, marginibus membranaceis; caules 17–25 cm. longi, virides, profunde sulcati. *Folia* ovato-lanceolata, acuta, 4–6 mm. longa, patentia. *Pedunculi* axillares, 1–4 cm. longi, bracteis paullo adnati, flores singulos terminales; bracteolis 3–4, 2–3 mm. longis involucrum parvum formantibus basi indutos gerentes; ex axillis bracteolorum pedunculi secundarii nonunquam orientes inflorescentiam continuantes. *Perianthium* extus viride, intus albidum, 3·5 mm. longum, segmentis 1·75 mm. longis ovato-lanceolatis paullo cucullatis glabris. *Filamenta* 1 mm. longa; antherae 0·75–0·85 mm. longae. *Stylus* 3 mm. longus. *Fructus* ignotus.

ANGOLA. Mndobua forest; near Malange, *Gossweiler*, 1114.

In a note to the specimen it is stated that the stems and branches are apparently deciduous.

1137. **Thesium viride**, *A. W. Hill* [Santalaceae]; species bracteolis involucellis *T. tristi*, A. W. Hill, affinis, etiam *T. unyikensi*, Engl., similis sed caulibus et foliis hirsutis praecipue differt.

Suffrutex perennis, caudex lignosus; caules erecti, sulcati, simplices vel ramosi, 25–35 cm. alti, ad basin ciliati, versus apicem glabri vel subglabri; rami foliosi elongati, floriferi breves, nudi. *Folia* subulata, acuta, circiter 2 mm. longa, adpressa, dorso ciliata vel subglabra. *Flores* in cymas axillares irregulariter dispositi, pedunculis vulgo elongatis nudis; bracteae et bracteolae ovatae vel subulatae, apiculatae vel acuminatae, 1–1·5 mm. longae, involucrum formantes. *Perianthium* 2–2·25 mm. longum, segmentis 1·5 mm. longis anguste ovatis cucullatis marginibus superne plus minusve conjunctis ciliatis. *Antherae* filamentis aequilongae, 0·35 mm. longae. *Stylus* circiter 1·75 mm. longus. *Fructus* globoso-ovoideus, circiter 2 mm. longus, costis 10 conspicuis reticulationibus distinctis.

NORTHERN NIGERIA. Katagun District: in dry bush, *Dalziel*, 416.

1138. **Osyris angustifolia**, *Baker* [Santalaceae]; species *O. abyssinicae*, Hochst., affinis foliis lanceolatis cymis bracteis adnatis elongatis praecipue differt.

Frutex glaber, virgatus, ramis erecto-patentibus 30–35 cm. longis angulatis sulcatis. *Folia* breviter petiolata, elliptico-lanceolata, 3–6 cm. longa, 4–6 mm. lata, acuta, coriacea, nervo medio inconspicuo. *Flores* in cymas numerosas multifloras axillares bracteis foliosis ex parte adnatis instructas paniculas terminales formantes dispositi; pedunculi 1–3 cm. longi; bracteolae squamiformes, ovatae, acutae.

Flores majusculi, perianthium urceolatum, circiter 1·5 mm. longum, segmentis 5, triangulari-ovatis acutis. *Antherae* globosae. *Flos femineus* segmentis perianthii anguste ovatis. *Stylus* circiter 0·5 mm. longus; stigmate capitato. *Fructus* globosus, 3 mm. diametro; costis et venis inconspicuis.

Tropical Africa. Mozambique district: Inhambane, *Scott*.

1139. **Osyris parvifolia**, *Baker* [Santalaceae]; species *O. abyssinicae*, Hochst., affinis sed habitu et in caulibus puberulis foliis parvis distinguenda.

Frutex circiter 1·2 m. altus, virgatus; ramis teretibus patentibus vel erecto-patentibus 10–15 cm. longis angulatis et sulcatis minute puberulis. *Folia* brevi-petiolata, oblonga vel obovato-oblonga, 0·8–1 cm. longa, mucronata, rigida, in siccitate fusca, minute puberula vel subglabra, nervo medio conspicuo. *Flores* dioici, in cymas axillares 3-floras dispositi; pedunculi puberuli vel subglabri, circiter 1–1·5 mm. longi, pedicelli brevissimi, glabri; bracteae ovatae, minutae. *Perianthium* in flore masculo urceolatum, 1·5 mm. longum, segmentis 3 late triangulari-ovatis subacutis glabris. *Antherae* 3, transverse ellipticae. *Stylus* brevissimus. *Flos* femineus et fructus non visus.

Abyssinia. Domak Efat, *Rohr*, 84.

1140. **Macaranga Beillei**, *Prain* [Euphorbiaceae-Crotoneae]; affinis *M. togoensi*, Pax, sed bracteis masculis altissime laciniatis stipulisque majoribus differt.

Frutex vel arbuscula ramis glabris. *Folia* longe petiolata, ovata, 10–15 cm. longa, 7–10 cm. lata, acuminata, basi 3-nervo rotundata vel obscure subcordata, deinde pennivenia, margine breviter dentata, membranacea, glabra; petiolus 7·5–10 cm. longus, glaber; stipulae lanceolatae, 2·5 cm. longae, subpersistentes, firmae. *Flores masculi* in paniculas laterales dispositi; bracteae ovatae, profunde laciniatae, florum fasciculos subtendentes. *Alabastra* globosa, minuta, puberula. *Stamina* 2. *Flores feminei* ignoti.

Tropical Africa. Upper Guinea: Ivory Coast; Bingerville region, Abidjean and Dabou, *Chevalier*, 15551.

Very nearly related to *M. togoensis*, Pax, and its allies *M. monandra*, Muell.-Arg., *M. Zenkeri*, Pax, and *M. Paxii*, Prain. From the three first it is at once readily distinguished by its large stipules which, while nearly as long as those of *M. Paxii*, are narrower, more rigid and more persistent. From all the four species named, *M. Beillei* can be at once distinguished by its very deeply laciniate male bracts.

XXXIV.—FORESTRY IN THE HIGHLANDS OF SCOTLAND.

W. Dallimore.

During the last week of June and the first few days of July, advantage was taken of the annual excursion arranged by the Executive Council of the Royal Scottish Arboricultural Society, to visit several estates in the Fort William district of Scotland, where afforestation is being conducted on a somewhat extensive scale.

On such an excursion, closely associated with a large company of men who are all interested in forestry from one aspect or another, either as proprietors of estates, factors, lecturers, timber merchants or foresters, opportunities naturally occur of gauging the possibilities of successful forestry in a country with which many of those present have been familiar since boyhood, and the following deductions have arisen from the observations made.

There are in the Highlands of Scotland fine woods of various kinds of timber, particularly larch, which at the present moment are bringing in, or are capable of bringing in, a considerable return to the owners for the money which has been laid out on them, but the amount of land planted is very small when compared with land of a similar character which might be turned into forests.

On the other hand, there is a great deal of land which is impossible so far as forestry is concerned, whilst other ground could only be got into a condition suitable for tree growth by the expenditure of considerable time and money. In such situations forestry has been tried, but after 30 years it has had to be pronounced a failure. This failure may be attributed partly to an injudicious selection of trees and partly to indifferent preparation of the ground in the first place; but much of it is due to bad natural conditions. Scots pine has been relied on far too widely in the past, and, though good plantations may be noted on the drier ground, those planted in wet situations have almost without exception proved a failure. Spruce on the other hand has given moderately good results here and there on boggy ground, particularly where drains were opened out at planting time. Altitude is not such an important factor in determining the limit at which successful forestry may be carried on as is soil and exposure, for on comparatively low hills, say 600 or 700 feet elevation, which are wind-swept or naturally wet, trees are less vigorous than others growing on well-drained ground at an altitude of 800 to 1500 feet, which are backed up and sheltered to a certain extent by higher ranges in the vicinity. Again, on high ground, though the whole of a certain area may not be suitable for planting, there are many *culs-de-sac* amongst the hills which offer excellent positions for plantations, as they are well sheltered and the soil is moderately good.

Some plantations in remote places are difficult of access, and for this reason the price realised for the timber has fallen considerably below the average. This would not, however, appear to be a serious argument against planting large areas in out-of-the-way places, providing everything else be suitable, for if once these areas were covered with good saleable timber means of removal would soon be forthcoming. It is when a small quantity of timber is cut one year and no more is cut for several years, that prices are low, for it does not pay a timber merchant to erect expensive plant for the purpose of dealing with a small quantity of wood.

The question as to how forestry may assist or interfere with existing sources of revenue is an interesting one. From their Highland estates, landowners appear to have three principal sources of income; these are the rent obtained for salmon rivers, deer forests, and sheep farms. In the case of fishing it is difficult to see how it can be affected one way or the other by afforestation. Deer

forests again do not appear to present an insurmountable difficulty, for people who are interested in the matter say that there would still be sufficient room for deer if all the suitable forest land were planted. Sheep farms, however, seem to offer serious difficulties, notwithstanding the fact that, very often, neither landlord nor tenant seem keen on retaining the farms, for it appears that through deterioration of land, the rapid increase of bracken-covered areas, and depreciation in the value of sheep, a much smaller number of sheep is reared than was formerly the case, whilst rents have fallen in value by about two-thirds. The farmer, however, sticks to his land, hoping for better markets or afforestation, whilst the landlord is equally loth to deprive his tenant of the farm, for if he does so, he is bound by law to take all the sheep at a valuation. The question of depriving shepherds of their means of livelihood by restricting the area of sheep farms scarcely needs consideration, for a comparatively small number of men would be inconvenienced and they would find ample forest work on the ground upon which they had been brought up.

Owing to the districts being so sparsely populated the housing of workmen is a question which requires careful consideration, for anyone who contemplates afforestation on an extensive scale must be prepared to erect workmen's houses and make arrangements for the transit of goods from the nearest town, which may be 15 or 20 miles away, and it would be better to calculate expenses from the winter condition of the country rather than the summer. Another expense which must be foreseen is the erection of deer fences and the making of good working roads where these do not already exist. From this it will be seen that in calculating the cost of planting a certain area, more things have to be taken into consideration than the mere purchase of the trees and their planting. Notwithstanding the various difficulties which arise, and the great initial expense of afforestation, several landowners are applying themselves assiduously to the work. Some know from past experience that they may calculate on a fair return for the money laid out, because their existing woods are a good source of revenue. Others, however, have no such guide and a great deal of their work is of an experimental character. They cannot hope for an adequate return for the money they are spending; but their estates are of great educational value and they deserve the thanks of all who are interested in sylviculture or arboriculture for the valuable experimental work they are carrying on.

The value of afforestation from a purely æsthetic standpoint is very noticeable in the Highlands, for after passing miles of bare hillsides a stretch of wooded country adds considerably to the natural beauty of the rugged mountains, rocky streams, and extensive lochs.

Although coniferous trees are usually advocated for planting in the Highlands, broad-leaved trees attain goodly proportions in many places. The most noticeable trees were larch, Scots pine, spruce, *Abies nobilis*, Douglas fir, beech, oak, lime, ash, sycamore and birch.

In the following notes, descriptions are given of the wooded areas on the estates visited during the tour. Some of the details were obtained on the estates and others have been taken from the Official Guide issued to members of the excursion party.

Corrour.

This is one of Sir John Stirling Maxwell's Invernesshire estates and is reached from Corrour Station on the North British Railway. Corrour Lodge, Sir John's residence, stands at the head of Loch Ossian and is about 5 miles distant from the station. At Corrour the railway reaches its highest point, 1350 feet, the surrounding country being very exposed and bleak. Loch Ossian is 1269 feet above sea level, and the greater part of the planting has been done about its banks. Situated at a high altitude the ground is poor and boggy, and the growing season is a short one, severe frosts being experienced during May and October. Snow storms are frequent during winter and are often accompanied by biting winds, so that on the whole the conditions are very unfavourable for forestry operations.

Handicapped as Sir John is by a difficult climate and poor, swampy ground at a high elevation, his planting is, perforce, of an experimental character. Perhaps his chief encouragement lies in the presence of butts of trees buried in the peat, which show, at any rate, that the ground was once capable of supporting their growth. He has, however, set himself the task of proving whether it is possible to grow trees under such unfavourable conditions, and no stone is being left unturned in his endeavour to solve the problem for the good of others less able to carry on expensive experiments.

The experiments have been in progress for a period of 15 years and most of the earlier plantings have been failures. In the earlier days the practice obtained of cutting open drains 18 inches wide through the bogs, 15 feet or so apart, and planting the intervening spaces. It is only, however, on the very edges of the drains that the trees have grown, other parts of the ground being as boggy as ever. The principal trees planted at that time were Scots pine, spruce, and larch. This system of planting was finally discarded three years ago in preference for that known as the "Belgian System." This consists of opening drains 6 to 7 feet apart, the drains being 18 inches wide and 12 to 15 inches deep. In taking out the drains, turves are cut 18 inches by 12 inches and the depth of the drain, and are laid bottom upwards on the ground between the drains at a distance of 3 feet apart each way. They remain thus for about 12 months, during which time they dry and sweeten, and decrease 3 or 4 inches in height. A three-year-old tree is then planted on each turf. The method of planting consists of scooping out the soil from the centre of the turf with a semicircular spade, the hole so made being about 6 or 8 inches deep and 5 or 6 inches wide. A mixture of basic slag and sand is carried by the planter who puts two or three handsfull into each hole. The excavated soil is broken up small and the tree planted in much the same manner as a plant would be potted. It takes a year for the plant to become established during which little growth is made; but the second year it grows vigorously and forms a large quantity of roots; whereas trees planted under the old system, after several years in the ground, have scarcely any more roots than they had at the time of planting. The third year the roots penetrate into the lower soil which by that time has become well aired and sweetened. It

might be imagined that in dry weather trees planted on raised turves would suffer from drought, but this is not the case.

It is impossible to say whether the trees will continue to thrive, but they certainly look well and very little filling up has had to be done. On lower land the system might be carried on with a great amount of success, for the winter conditions would be more favourable and snow would not be likely to do so much damage. The principal trees planted at the present time are Sitka spruce (*Picea sitchensis*), common spruce (*P. excelsa*), white spruce (*P. albà*), oriental spruce (*P. orientalis*), mountain pine (the upright growing form, *Pinus montana uncinata*), larch, and *Abies nobilis*. A Sitka spruce planted in 1893 under better conditions than the other trees is now 24 feet high, whilst a tree of *Abies nobilis* of the same age is 23 feet high. The latter, however, lost its lead for a time. For the last 11 years common spruce has made an annual growth in height of 21 inches.

The proportion of basic slag to sand used in planting is one to seven, whilst the cost of making the drains and laying out the turves is £2 15*s*. an acre. One man can make the holes for two or three planters. A good workman plants 800 trees per day, at a cost of 3*s*. 4*d*.

A delightful feature at Corrour Lodge is an Alpine garden which has been formed between the house and the loch. It is an almost level piece of ground with shrubs on three sides and a terrace supported by a granite wall at the other. The area contains a small pond in the centre and is laid out with granite-paved paths and irregular shaped beds bordered with granite. Crevices in the wall are filled with showy alpines, whilst masses of choice subjects occupy the remaining space. Remarkably fine groups of *Rhodothamnus Chamaecistus*, *Rhododendron kamtchaticum*, *R. ciliatum*, *R. ferrugineum*, *Loiseleuria procumbens*, *Primula sikkimensis*, *Hypericum reptans*, saxifrages in variety, &c., were noted.

Ardverikie.

The Ardverikie Estate is owned by Sir John Ramsden and extends over a considerable area of land about Loch Laggan and Loch Ericht. The mansion stands on the south side of Loch Laggan, about 17 miles distant from Tulloch station. All the ground is at a fairly high elevation and the planting operations have been conducted at an altitude of from 800 to 2,000 feet above sea level.

In a memorandum communicated to the R.S.A.S. by Sir J. Ramsden he gives the following account of his early work on the estate :—

"At Whitsunday, 1871, I entered into possession of the Ardverikie Estate. The erection of the deer fence of galvanized iron and wire, 6 feet high, was begun forthwith. This fence, running along the tops of Druim na Beiste, and of Craig Hur, by the west end of East Loch Arab and down to Loch Laggan between the two Binions, encloses about 3,670 acres, including Kinloch Wood, East Loch Arab, the East Binion, the north face of Craig Hur, and about 5 miles in length of the southern shore of Loch Laggan. The completion of this fence, and the shooting

of 800 hinds bred on and always belonging to this great extent of ground, occupied the whole of the year 1872, and it was not till 1873 that a beginning was made in planting the ground thus enclosed."

"For several years after this enclosure was completed nearly all our energies were devoted to planting it up, and for some years in succession we planted out an average number of two million trees, chiefly Scots firs, in every season."

The trees which have been planted most extensively are Scots pine, larch, spruce, *Abies nobilis*, *A. grandis*, *A. Nordmanniana*, and Douglas fir (*Pseudotsuga Douglasii*). In the drier places larch and Scots pine have done well even in the higher positions, but they have proved a failure on wet ground. A plantation of Scots pine which was planted between the years 1884–86 was noted. The trees averaged 32 feet in height and of four successive trees the girths at 4 feet above the ground were 2 feet, 2 feet 2 inches, 1 foot 7 inches, and 2 feet 3½ inches. This plantation occupies dry ground at an altitude of about 900 feet. A plantation of larch growing under similar conditions averaged 40 feet in height, and the best trees averaged 2 feet 6 inches in girth; there were, however, quite an equal number of trees below 18 inches in girth. Spruce has proved more successful on wet ground than most of the other trees planted; but taking one position with another *Abies nobilis* is the most vigorous tree. Douglas fir thrives in sheltered places, but has failed when exposed to cutting winds. The clean growth of *Abies nobilis* is astonishing, for no trace of disease is to be found. This is all the more remarkable as the spruce is badly infested with *Chermes abietis*, an insect which is said to cause serious injury to *Abies nobilis* also.

The following notes which were prepared for the "Guide" for the R.S.A.S. by Mr. Fraser, factor to Sir J. Ramsden, are very interesting, as they record the progress of forestry operations at Ardverikie from their commencement in 1873.

"*Total extent planted.*—From 1873 to this date, 10,400 acres or thereabouts have been planted—and in doing this 34,000,000 plants have been used, giving an average of 3,276 plants to the acre.

"*Elevation of plantations.*—Loch Laggan is 817 feet above sea-level, and the plantation is alongside the loch. Loch Arb is 1,142 feet above sea-level, and the plantations in the neighbourhood of both lochs are doing exceedingly well. Along Loch Arb side Scots pine and larch are doing well up to an altitude of 1,500 and 1,700 feet.

"*Species employed.*—The greater part of the Ardverikie plantations consists of Scots pine, larch, and spruce mixed. There are two plantations, of about 500 acres in each, of pure larch; one at Loch Ericht side at an altitude of 1,160 to 2,400 feet, and the other on Meall-an-Domhnaich in Glenspey, at an altitude of 1,000 to 1,700 feet. Both plantations have a southern exposure. When the plantations were from 6 to 8 years old a number of the plants got disease and died out. A fair proportion, however, recovered, and are now doing exceedingly well, leaving a crop of about 1,000 trees to an acre."

On the lower ground and along the roads a number of ornamental trees have been planted, and they are doing exceedingly well.

These consist chiefly of *A. nobilis*, Douglas fir, *A. grandis*, and silver fir (*A. pectinata*).

"*Method of planting*.—Notch system and at an average of 3½ feet to 4 feet apart, using chiefly 2-year 1-year (*i.e*, plants 2 years in the seed bed and 1 year transplanted) for the Scots pine, larch from 12 to 16 inches and spruce from 9 to 12 inches.

"*Source of planting*.—A number of plants have been reared from seed in the estate nursery, but the greater portion was raised by buying 1-year 1-year (*i.e.*, 1 year in the seed bed and 1 year in the nursery) and 2-year seedlings, and laying them in the nursery for a year before planting out; a quantity of plants was also bought in and planted direct on the ground.

"*Draining*.—About 400 miles of drains have been made throughout the plantations, or an average of about 3 chains to the acre. The drains are cast about 18 inches by 12 inches by 18 inches deep, and cost from 2*s*. 6*d*. to 4*s*. 6*d*. a chain.

"*Roads and paths*.—The extent of carriage roads made since Sir John purchased the property is about 40 miles—they are generally from 8 to 10 feet wide—and cost 3*s*. to 5*s*. a yard to construct. About 45 miles of walks at a cost of 9*d*. to 1*s*. 6*d*. per lineal yard have been made. The walks in the plantations are generally from 4 to 5 feet wide, and the pony tracks through the forest 3 feet wide between the borders.

"*Number of men employed*.—There is now an average of 40 men employed, but between 1872 and 1890 the number would be quite double this.

"*Length of fencing*.—There are 40 miles of fences with 6 and 7 lines of wire, and about 35 miles of deer fence with 9 and 10 lines of wire. The ring fences consist principally of heavy iron standards placed at 6 feet apart, and 9 and 10 lines of No. 6 wire.

"The fences enclosing the smaller plantations are principally of wooden posts (larch and tarred); the posts are placed at 6 feet apart. The cost of the lower fences is from 1*s*. to 1*s*. 6*d*. a yard, and the high fences from 1*s*. 6*d*. to 2*s*. 6*d*. a yard."

According to Mr. Fraser, at an altitude varying from 900 to 1,300 feet the quality of the soil generally is of a rich alluvial character peculiarly suitable for *Abies nobilis*, *A. grandis*, Douglas fir, silver fir, spruce, &c. From 1,300 to 1,800 feet the soil varies much. Peat occurs frequently and where it lies wet young trees have a great difficulty in becoming established. If this kind of ground were treated similarly to that at Courrour better results would probably be obtained. When the trees are once able to penetrate the peat they commence to grow more kindly.

Mr. Fraser submitted the average rate of height growth for a period of 30 years as follows :—

Scots pine up to an altitude of 1,500 feet	...	8 to 10 inches.
Larch " " " "	...	12 inches.
Spruce to 1,300 feet altitude...	... ...	12 "
Abies nobilis to 1,200 feet altitude	... ...	15 "
" *grandis* to 1,200 feet altitude	... ...	15 "
" *Nordmanniana* to 1,200 feet altitude	...	9 "
Douglas fir to 1,200 feet altitude	... ...	15 "
Silver fir to 1,400 feet altitude	... ...	6 to 9 inches.

At altitudes of 1,500 to 1,800 feet growth is considerably less than it is lower down.

Forestry operations are carried on by about 40 permanent men and about as many others imported from Skye for 8 or 9 months of the year. The permanent men have houses on the estate and the temporary hands are provided with bothies. Furniture, house linen, &c., are supplied to the latter, and tradesmen visit them twice a week with provisions. When winter sets in they return to Skye, reappearing for the commencement of the planting season in April.

The cost per acre for planting on the Ardverikie estate is given as follows :—

	£	*s.*	*d.*
Price of plants	1	14	0
„ labour	0	12	0
„ draining	0	6	0
„ fencing	1	0	0
	£3	12	0

Invergarry.

This estate, the property of Mrs. Ellice, formerly belonged to the Macdonells of Glengarry, and the ruins of the old castle are still in their possession. The rock on which the old castle stands is famous as the gathering place of the Macdonells of Glengarry, and their war-cry—"Creagan an Fhithick"—the Rock of the Raven, is taken from it. Invergarry House stands a short distance from the old castle and is pleasantly situated amongst the well-wooded hills which surround Loch Oich. The altitude of the woods hereabouts is considerably lower than in the places previously referred to, for they vary from 100 feet to 800 feet above sea level. Many of the plantations were formed about 40 years ago, but some are older, one wood called Craiglea being close on 100 years of age. There is a great deal of excellent timber on the estate; the trees, as a rule, being tall and the trunks clean. Decayed and worthless timber, which is sometimes so conspicuous in southern woods, is almost absent at Invergarry. The most common trees are larch, Scots pine, spruce, silver fir, oak, birch, and sycamore. Attention was directed to a larch wood 25 years old. This, a few years after being planted, was so badly infested with larch disease that it was condemned. The forester, however, begged that it should be given a further trial and it gradually grew out of the disease. The trunks now are perfectly clean and straight and are about 40 feet high. Four consecutive trees girthed at 4 feet from the ground, 2 feet, 2 feet 2 inches, 1 foot 7 inches and 2 feet 3½ inches, respectively. Fine, mature larch were noted in several places. Two which were measured were 97 feet high by 8 feet 8 inches in girth at 5 feet above the ground and 107 feet high by 8 feet in girth respectively. Many tall spruce were noted which girthed upwards of 6 feet, whilst *Abies nobilis* was 97 feet high and 7 feet 7 inches in girth. The age of the last named is 40 years. Sycamores grow to a large

size at Invergarry, and good beech were also seen. An experimental area of 60 acres was commenced a few years ago. This has been planted up in blocks of various kinds of trees. The cost of the work on this ground has been defrayed by the sale of the birch which formerly covered the site.

Achnacarry.

Like Invergarry, Lochiel's estate of Achnacarry is invested with great historical interest, and at both places Prince Charlie spent a short period during the stirring times of 1745. An avenue of very fine beech trees may be seen at Achnacarry Castle, which has an interesting connection with Prince Charlie. The following account of the avenue as given by Lochiel is included in the guide previously mentioned by Mr. Charles Mackenzie, Lochiel's factor.

"At Achnacarry Castle there is an interesting and historical beech avenue, which was planted in 1745 by the Lochiel of the day. At this time Lochiel, following the fashion of that day, had been preparing to plant a long beech avenue. He had all his plants in readiness, but shortly after he had made a start word was brought to him that Prince Charlie had landed and commanded his presence. Lochiel 'heeled' in his seedlings in a trench along the river-side to await his return, and hurried off to meet the Prince. He never returned, and the trees still remain where they were then put, and now form a beautiful walk by the side of the River Arkaig."

The woods on the estate have an area of about 7,000 acres, some being natural and the others planted. The natural woods consist principally of Scots pine, oak, and birch, whilst the plantations are chiefly larch and Scots pine. Larch plantations of various ages contain fine timber. Clunes Wood, 50 acres in extent, was planted 41 years ago. At present there are about 340 trees per acre, and they average about 55 feet in height, but are not very big in girth, and taper very little. A few successive trees girthed at 4 feet from the ground gave 2 feet, 2 feet 3 inches, 1 foot 3 inches, 2 feet 5 inches, 2 feet 8 inches, 1 foot 9 inches, 3 feet 2 inches, and 4 feet. In a portion of the wood which had been less heavily thinned the trees were quite 10 feet higher. Tor à Mhiult Wood contains a lot of very fine larch. Its area is 90 acres, 60 acres having been planted 64 years and the remainder 40 years. There is an average crop of 250 trees per acre, and the trees range from 90 to 100 feet high with clean trunks of from 75 to 80 feet. They narrow very slowly throughout their length. Several trees girthed at 4 feet gave the following results:—3 feet 7 inches, 3 feet 9 inches, 3 feet, 3 feet 2 inches, 4 feet 11 inches, and a tree which had been given more room 6 feet 6 inches. Some of the trees felled had a diameter of 4 inches at 85 feet from the ground. Near the foot of this wood were seen good examples of *Picea sitchensis* and *Pseudotsuga Douglasii* which were planted in 1865. As nearly as could be ascertained they were about 98 feet high and girthed 8 feet 8 inches and 8 feet 10 inches respectively at 5 feet above the ground. Tall specimens of *Abies Lowiana* with a girth of 6 feet 10 inches and *Cupressus Lawsoniana* girthing 5 feet 4 inches were noted. A

natural oak wood on a rocky hillside contained a lot of good timber which is used largely for fencing. Birch is very evident in places, and of this a good deal has been disposed of lately at 13*s*. a ton delivered green at the pier near by. In the gardens a specimen of *Sequoia gigantea* was noted which, though but 45 years old, is 104 feet high and girths 10 feet 7 inches. The largest beech in the avenue previously mentioned girthed 17 feet 5 inches, whilst an old oak known as "Coille Bos Oak" has a girth of 23 feet at 5 feet high.

The finest timber on the estate, however, is to be seen in Lochiel Old Forest. This is almost exclusively Scots pine. It is of large extent, and occupies rough, uneven ground on steep hill-sides. Many of the trees have clean trunks from 50 to 70 feet in height and girth from 9 to 11 feet. One remarkable old specimen divides at 6 or 8 feet from the ground into four enormous limbs, each one of which would form a large tree. The union of the limbs forms a kind of basin in which a seedling pine has grown which is now quite 20 feet high with a diameter of 6 or 8 inches, as near as could be ascertained from the ground. The girth of this tree is 18 feet 4 inches below the limbs, whilst at the limbs it is 27 feet in girth.

The following is Mr. Mackenzie's account of Lochiel Old Forest :—

"This forest is the finest of the few remaining natural Scots pine forests in Scotland. It extends to about 1,500 acres, running for six miles along the mountain slopes. The trees are nearly all very old, mostly from 200 to 300 years, and many of them are of an immense size. The largest in the forest has a circumference of 18 feet 4 inches at 5 feet. The heaviest of the trees are in Glenmallie, about 5 miles from Achnacarry. A few are now dying and dead, and although some are still growing well, the forest has long since ceased to make a profitable growth.

"The timber when sawn is of splendid quality, being very close in the grain and resinous, and resembling in outward appearance good pitch pine more than Scots pine. When used for estate purposes it is found to be very durable.

"This timber was largely used in the construction of houses 100 years ago, and among the houses where it was so used was the present house at Achnacarry, where the joists and doors were all constructed with it, and they still remain as good as ever. Telford, in 1827, reported this timber as being finer and more durable than the best Baltic timber.

"Natural regeneration is not proceeding to any considerable extent. There are a great many seedlings showing in some parts of the forest, but it is only in certain small areas that they promise to grow to any size. In other parts the dense herbage on the ground and the deer grazing effectually destroy them.

"At Gusach, a little further up Loch Arkaig side, there are the remains of another large forest of the same class. This wood was cut down 100 years ago, but there is still a sufficient seeding crop on the ground, and in some spots the seedlings are doing well. The extent of this part is about 900 acres."

XXXV.—FUNGI EXOTICI: XI.

(With Plates.)

G. Massee.

Of the twelve new fungi here described from material sent to the Royal Botanic Gardens, perhaps the most important is the new species of *Eutypa*, named *E. caulivora*, Massee, a parasite on the wood of *Hevea brasiliensis*, sent for identification by Mr. H. N. Ridley, Director, Botanic Gardens, Singapore.

A new genus, *Pilula*, Massee, with one species, *P. straminea*, is described from material sent from Nyasaland.

Two other species are of some interest, namely, *Sphaerulina Worsdellii*, Massee, and *Phoma welwitschiae*, Massee, as they were found on the dead tips of the leaves of *Welwitschia mirabilis*, Hook. f., in Damaraland, by Mr. W. C Worsdell.

One species, *Nectria theobromicola*, which was found on pods of *Theobroma cacao*, has been named by Mr. C. K. Bancroft.

Agaricaceae.

Marasmius sordidus, *Massee*.

Pileus primo subglobosus dein applanatus, 1·5–2 cm. latus, medio umbilicatus, margine primo incurvus grosse sulcatus, sordide fuscescens, glaberrimus. *Lamellae* decurrentes, utrinque attenuatae, angustae, distantes, pileo concolores, rugis transversis confertis centralibus majoribus stricte lamelloideis concoloribus conjunctae. *Stipes* erectus vel incurvus, cartilagineus, fistulosus, laevis, glaber, fuscescens, 3 cm. longus, 3 mm. crassus. *Sporae* ellipsoideae, oblique apiculatae, hyalinae, 5 × 3 μ.

West Indies. Trinidad: on dead twigs, *H. Carracciola*, 30.

Allied to *Marasmius cubensis*, Berk. & Curt., differing in the narrower, decurrent gills and smaller spores.

Lentinus egregius, *Massee*.

Pileus profunde infundibuliformis, 12–15 cm. latus, submembranaceus, rigidus, brunneus, ubique squamulosus, margine recto integro ciliato. *Lamellae* angustissimae, ligneo-albidae, acie integerrimae. *Stipes* rectus, subteres, sursum incrassatulus, densissime velutinus, fulvescenti-cinnamomeus, 7–9 cm. longus, circa 1·5 cm. crassus. *Sporae* hyalinae, obliquae, ovoideae, 6 × 4 μ.

Australia. Brisbane: growing on wood, *Bailey*, 4. Coll. *A. J. Boyd*.

One of the largest and most beautiful of known species of *Lentinus*. Most nearly allied to *L. velutinus*, Fries, which differs in its smaller size, more distant gills, and smaller spores.

Hypholoma Talbotiae, *Massee*.

Pileus convexus dein applanatus, subumbonatus, circa umbonem depressus, ubique densissime squarroso-squamulosus, purpureus, 3–4 cm. latus. *Lamellae* postice rotundato-sinuatae, latae, margine crenulatae, dilute violaceae, subdistantes. *Stipes* teres, minute fistulosus, ad tertium inferum squarroso-squamulosus, sursum glaberrimus, pileo concolor, 4–5 cm. longus, 4–5 mm. crassus. *Sporae* oblique ellipsoideae, lilacino-tinctae, 6 × 4 μ.

Tropical Africa. Southern Nigeria: Oban, *Mrs. Talbot*.

A very beautiful and distinct species, characterised by the purple colour of every part, and by the densely squarrosely scaly pileus and stem.

Lenzites adusta, *Massee*.

Pileus horizontalis, dimidiatus, antice semi-orbicularis, coriaceo-subcartilagineus, plus minusve flexilis, margine subincurvo acuto, superne dilute brunneo-fumosus, minute adpresseque puberulus vel glabratus sed tactu fere velutinus, 8 9 cm. latus, contextus fibrosus, pallidus. *Lamellae* subconfertae, ochraceo-flavae, rigidulae, radiantes, usque ad marginem productae. *Sporae* ellipsoideae, oblique apiculatae, hyalinae, 7 × 4·5 μ.

India. Bengal: on wood, *S. Hutchings*. Presented by Mr. C. G. Lloyd. Most nearly allied to *Lenzites Beckleri*, Berk., which is also an Indian species.

Polyporaceae.

Polyporus indicus, *Massee*.

Pileus maximus, suborbiculatus, applanatus, irregulariter subconcentrice ac subradiatim undulatus, fissus (an pilei duo pleuroti dorso connati ?), margine acuto, sordide rufo-brunneus, versus marginem aureo-flavidus, glaber, 25–30 cm. diametro; contextus suberoso-fibrosus, cinnamomeus, circa 1 cm. crassus. *Stipes* centralis, breviusculus, crassus, fusco-brunneus. *Tubuli* gracillimi, ore rotundato-angulato, 1 cm. longi, marginales breviores.

India. Baroda: on the ground, probably attached to buried wood or roots, *B. Cavanagh*. Presented by Mr. C. G. Lloyd.

A remarkably fine and very distinct species not closely allied to any known form, but suggests affinity with *Polyporus Schweinitzii* and its allies.

Polyporus confusus, *Massee*.

Pileus coriaceus, tenax, glaber, infundibuliformis, rubro-brunneus vel gilvus, 5–6 cm. latus. *Stipes* centralis, rectus vel incurvus, circa 2 cm. longus. *Pori* curti, minuti, inaequales, decurrentes, cinnamomeo-lutescentes, pallidi. *Sporae* cylindraceo-ellipsoideae, utrinque subacutae, hyalinae, 12–14 × 4–5 μ.

North America. Louisiana: on wood, *J. B. Ellis*, 6007.

This species superficially closely resembles *Polyporus craterellus*, Berk. & Curt., differing more especially in the elongated spores. In *P. craterellus* the spores are sub-globose, averaging 5 × 4 μ. This feature of distinction was detected by Mr. G. C. Lloyd, who is now engaged in a critical study of the *Polyporeae* in the Kew Herbarium.

Sphaeriaceae.

Nectria theobromicola, *Bancroft*.

Perithecia gregaria, globosa, salmonicoloria, hypothallo aurantiaco insidentia, 280–300 μ diametro. *Asci* cylindraceo-clavati, breve stipitati, octospori, 80–90 × 8–10 μ, paraphysibus filiformibus obvallati. *Sporae* distichae vel monostichae, elliptico-oblongae, utrinque obtusae, 1-septatae, ad septum constrictae, 16–20 × 6 μ.

EUTYPA CAULIVORA.

Stroma on trunk of *Hevea brasiliensis*.

[*To face page* 250.

EUTYPA CAULIVORA.

Section of trunk showing dark lines formed by the mycelium in the wood.

[*To face page* 251.

Tropical Africa. Received from West Africa on pods of *Theobroma cacao*, which were also attacked by *Diplodia cacaoicola*, P. Henn.

Eutypa caulivora, *Massee in Agric. Bull. Str. and F. M. States*, ix. 217 (nomen).

Stroma latissime effusum, innatum dein superficiale, e ligno nigrefacto efformatum, extra intusque nigrum. *Perithecia* densissime stipata, ovoidea, ostiolo breviusculo atro stromatis superficiem vix attingente donata. *Asci* cylindraceo-clavati, parte sporifera subfusoidea, aparaphysati, octospori. *Sporae* ellipsoideae, utrinque obtusatae, hyalinae vel dilute chlorinae, 32–35 × 9–11 μ.

Malay. Singapore : Botanic Garden, *H. N. Ridley*.

Forming numerous large black blotches on the trunk of a specimen of the Para rubber tree—*Hevea brasiliensis*, Muell.-Arg. Other species of *Eutypa*, as *E. erumpens*, Mass., and *E. gigaspora*, Mass., are destructive parasites to timber trees, and undoubtedly *E. caulivora* is a tree parasite, although the fruit of the fungus only appears on the surface of the trunk when the tree is dead. A section of the trunk shows the dark lines formed by the mycelium of the fungus extending quite to the centre, and proves that in the example under consideration the fungus had been present in the tissues for some considerable time previous to the death of the tree. Death ensued from starvation, owing to the water supply from the root being checked by the copious development of mycelium in the water-conducting tissue. It is highly probable that the fungus occurs on indigenous trees, and has passed from thence to the cultivated rubber trees, which, judging from the material received, prove to be admirably adapted to meet the requirements of the parasite. A careful search for the presence of this fungus on indigenous trees should be made, and its extermination attempted, if discovered in localities where the establishment of a rubber plantation is contemplated.

An account of this fungus has been published in the Agricultural Bulletin of the Straits and Federated Malay Straits, ix, pp. 216–218, from which the following paragraph by the editor is taken.

"On two or three occasions we had observed that on dead trunks of Para rubber trees, after being untouched for some weeks, the outer corky layer of bark split off in flakes and beneath appeared large black patches of a fungus.

"This fungus was in the form of a crust, black, hard and rather brittle, about $\frac{1}{16}$–$\frac{3}{8}$ inch thick, and looking like dried tar or asphalt. It formed rather irregular patches of various sizes from one to ten inches across, the edges of the patches being rounded, and the mass usually longer than broad. In one tree about 25 years old and about two feet through, there were no previous signs of any disease but the tree rather suddenly died and the fungus came out on the wood some weeks later. Since then the next tree to it has died, much in the same way as if it had been killed by *Fomes*, but it was not attacked by that. On removing the stump we found that just below the tree was an accumulation of foul-smelling water. The roots of the tree were quite dead. Several other trees in this part of the garden, but at some little distance, died in a somewhat similar manner. None of these, however, so far as I remember

except the first-mentioned one, showed any sign of the fungus after death, and indeed on seeing the foul putrid mass of water and decayed sticks in which the trees' roots had been living, I was more surprised that they had lived so long than that they had died.

"About the end of last year, a small tree eight inches through in another part of the garden was overset with several others by a gale and its roots were badly broken. It was replaced in position but never recovered and remained erect, but dead for some time.

"It then developed the fungus in several parts of the stem from about 5 feet downwards."

Sphaerulina Worsdellii, *Massee*.

Perithecia late gregaria, globoso-lenticularia, epidermide velata, membranacea, atra, contextu densiuscule parenchymatico fuligineo, ostiolo vix papillulato donata, 120–130 μ diametro. *Asci* aparaphysati, rotundati, crassiuscule tunicati, octospori. *Sporae* cylindraceo-clavatae, hyalinae, diu 1-septatae, demum 3-septatae, 24–25 × 8–9 μ.

Tropical Africa. Damaraland: near Welwitsch; on the dead tips of leaves of *Welwitschia mirabilis*, Hook. f., *W. C. Worsdell*.

Pilula, *Massee*; gen. nov.

Perithecia superficialia, globosa, astoma, membranacea, glabra, pallida. *Asci* elongato-fusoidei, octospori, aparaphysati. *Sporae* ellipsoideae, 1-septatae, hyalinae.

Superficially this genus closely resembles *Eurotium* in the pale coloured, superficial, astomous perithecia, but differs markedly in the elongated asci and the elliptical, 1-septate spores.

Pilula straminea, *Massee*.

Perithecia dense gregaria, minuta, 180–200 μ diametro, glabra, laevia, straminea, contextu parenchymatico pellucido in sicco cupulato-collapsa, mycelio tenuissimo effuso insidentia. *Asci* elongato-fusoidei, in stipite longiusculo attenuati, cito diffluentes, 85–90 × 12–15 μ. *Sporae* ellipsoideae, utrinque subacutae, 1-septatae, ad septum non constrictae, hyalinae, 12–15 × 6 μ.

Tropical Africa. Nyasaland: Zomba; appeared in quantity on some cotton wool or similar substance used for packing fungi, *J. Stewart J. McCall*.

Forming a densely gregarious patch of minute straw-coloured, globose perithecia, indistinguishable under a lens from *Eurotium*.

Tuberaceae.

Elaphomyces sapidus, *Massee*.

Ascomata subglobosa, indurata, atrobrunnea, minutissime verruculosa, basi manifeste nulla, fibris radicalibus destituta, 3–5 cm. diametro. *Sporae* globosae, episporio ubique majuscule verrucoso, saturate olivaceo-brunneae, 12–16 μ diam.

India. United Provinces, *I. H. Burkill*, 29,518.

An edible species, eaten by the natives. Approaching *Elaphomyces papillatus*, Vitt., in the minutely warted peridium, but differing markedly in the larger, coarsely warted spores.

Sphaeropsidiaceae.

Phoma welwitschiae, *Massee*.

Perithecia erumpenti-superficialia, dense aggregata, hemispherica, atra, contextu dense parenchymatico fuligineo, ostiolo minuto pertuso, 150–180 μ diametro. *Conidia* elliptica, utrinque obtusiuscule rotundata, grosse 2-guttulata, hyalina, 5 × 3 μ, sterigmatibus simplicibus fulta, 8–10 × 1·5 μ.

Tropical Africa. Damaraland: near Welwitsch; on the dead tips of leaves of *Welwitschia mirabilis*, Hook. f., *W. C. Worsdell*.

The perithecium is exceptionally thick and dense, and the ostiolum or pore is very minute. The conidia are involved in mucus which sets hard when dry, but dissolves and swells very much when moistened and is extruded through the ostiolum carrying the conidia along with it. In every respect the fungus is as xerophytic as its host.

XXXVI.—MISCELLANEOUS NOTES.

Mr. C. K. Bancroft, B.A., formerly Major Scholar of Trinity College, Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Mycologist in the Federated Malay States.

Mr. Albert Richard Gould, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of the Gold Coast in succession to Mr. J. Anderson (*K.B.* 1905), resigned.

Mr. William Leslie Wood, lately a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendent of Government Plantations in the Federated Malay States in succession to Mr. F. R. Long (*K.B.* 1908, 195), resigned.

Mr. L. Lewton-Brain. We learn that Mr. Lewton-Brain formerly Mycologist and Lecturer in Agriculture to the Imperial Department of Agriculture for the West Indies (*K.B.* 1903, 30), and afterwards Assistant Director in the Division of Physiology and Pathology in the experiment station of the Hawaiian Sugar Planters' Association, has been appointed Director of Agriculture in the Federated Malay States in succession to Mr. W. J. Gallagher (*K.B.* 1909, 342), resigned.

Mr. J. B. Carruthers.—It is with deep regret that we learn of the death, at the age of 41, of Mr. John Bennett Carruthers, F.R.S.E., F.L.S., whose appointment as Assistant Director, Department of Agriculture, Trinidad, was noticed in *K.B.* for 1909, p. 150. The son of Mr. W. Carruthers, F.R.S., formerly Keeper of the Botanical Department, British Museum, Natural History, Mr. J. B. Carruthers was educated at the Royal School of Mines, London, and at the University of Griefswald. He became Demonstrator of Botany at the Royal Veterinary College in 1892, Professor of Botany at the Downton College of Agriculture in 1895, and in 1898 was deputed to Ceylon to investigate Cacao Tree Disease. In 1900 he was appointed Assistant Director of the Royal Botanic Garden, Peradeniya, and Mycologist to the Government of Ceylon. In 1905 he was transferred to the Federated Malay States as Director of Agriculture and Government Botanist. In 1909 he was appointed Assistant Director of Agriculture and, shortly thereafter, also Government Botanist, Trinidad. During an official visit to Tobago he contracted a chill, followed by pleurisy and eventually empyema and septic pneumonia, to which he succumbed on 17th July, 1910, after an illness of 45 days' duration.

Ammannia dentelloides, *Kurz.*—In 1870 Kurz described a curious mud-plant under the name of *Ammannia* (*Rotala*) *dentelloides* (*Journ. Asiat. Soc. Beng.* xxxix. ii. 76) as "frequent in Northern Bengal, as in Purneah, Kissengunge, Titalaya, up to the Sikkim Terai, in dried up ponds and ricefields, shortly after the rains; also in Behar, and Arracan in Kolodyne valley, Akyab, &c." It was described as having the habit of *Dentella repens*, Fort., and *Ammannia pygmaea*, Kurz, but differing from the latter in the differently-shaped calyx, and in the absence of the usual purple colour. Mr. C. B. Clarke also obtained it at Siligori, near Darjeeling, and included it in his Monograph of the Indian *Lythraceae* (*Hook. f. Fl. Brit. Ind.* ii. 568). Koehne (*Engl. Pflanzenr., Lythr.* 35) has remarked that *Ammannia dentelloides*, Kurz "est Scrophulariacea!" and an examination of the specimens shows that they are identical with *Microcarpaea muscosa*, R. Br., a monotypic Scrophulariaceous genus found in numerous localities in India, also in Ceylon, Tonkin, Hongkong, Java, and tropical Australia.

R. A. R.

Carex runssoroensis, *K. Schum.*—Up to the present the inflorescence is the only part of this remarkable species that has been described, although there is a photograph of a complete specimen in Ann. di Bot. Roma, vii. (1907), tab. xxxi. Good specimens, however, collected by Kassner in the Mabuka Valley, Ruwenzori, no. 3140, have recently been received, and it is now possible to supplement the description given in the Flora of Tropical Africa, viii., 516, and in Pflanzenreich, *Cyperaceae-Caricoideae*, p. 74.

The plant grows in compact tufts. All the stems are densely clothed at the base with shining, chestnut-brown coloured, membraneous sheaths. The apex of these sheaths bears a more or less rudimentary, hardened, acuminate blade. These blades are slightly

flattened, smooth and rather rigid ; the longest measures 3·5 cm. The stems are smooth, terete, and of a pale green colour. The most remarkable feature is that the majority of the stems are apparently barren, and these apparently barren stems exceed the flowering ones in length, the longest measuring 5·5 cm. and having a diameter of 1·5 mm. The apex of each is marked with a prominent scar. This suggests that these stems at one time bore an inflorescence. This inflorescence probably shed its nuts and glumes, and then the naked rhachis broke off at the lowest joint. A similar appearance is met with in *Carex aphylla*, Kunth, a South American species.

The internal structure shows the presence of a large number (about 30) of vascular bundles arranged near the periphery and alternately larger and smaller. Each bundle is surrounded by a sclerenchymatic cylinder more developed in the radial direction, and is separated from its neighbour by an aerenchymatous canal. The centre is occupied by colourless, more or less broken up parenchyma (pith). This internal structure is similar to that of *C. monostachya*, but in that species the outline is triangular, whereas in *C. runssoroensis* it is circular. Another great difference is that in *C. monostachya* the leaf blades are fully developed, often being as long as the stem, are flattened, and have a prominent midrib.

W. B. T.

Botanical Magazine for August.—The plants figured are *Bulbophyllum virescens*, J. J. Smith (t. 8327); *Patrinia triloba*, Miq. (t. 8328); *Pterostyrax hispidum*, Sieb. et Zucc. (t. 8329); *Gamogyne pulchra*, N. E. Br. (t. 8030); and *Psoralea affinis*, Eckl. et Zeyh. (t. 8331).

The *Bulbophyllum* is a handsome species belonging to the group which includes *B. Ericssoni*, Kraenzl. (t. 8088), and *B. Binnendijkii*, J. J. Smith (t. 8187), to the latter of which it is most nearly allied, differing in having larger flowers without spots. *B. virescens* was first described from specimens collected on Mount Tuna in the island of Amboina, and the plants in cultivation were obtained from an island off the coast of New Guinea by Messrs. Hugh Low & Co., from whom the plant figured was purchased in 1905. *Patrinia triloba* is a pretty valerianaceous plant with palmately lobed leaves and ternate cymes of small yellow flowers. It is a native of Japan, and thrives well in the Rock Garden at Kew, where it was raised from seed communicated by the Tokyo Botanic Garden. *Pterostyrax* is a small genus of Styraceæ, and is closely allied to *Halesia*, to which it is united in Bentham and Hooker's Genera Plantarum. It differs, however, in several well-marked characters, including the position of the inflorescence, the shape of the corolla and the number of its lobes, and in the absence of the broad wings of the fruit. *P. hispidum* is a tree bearing long axillary pendulous or ascending panicles of white flowers, and is a native of Japan. The material for the figure was obtained from Canon Ellacombe of Bitton, near Bristol, who is the owner of a very fine specimen. The species is quite hardy at Kew. *Gamogyne pulchra*, an araceous plant from Malaya, was received from the Singapore Botanic Garden in 1905. It is a small herb with lanceolate leaves and bright crimson nodding convolute spathes less than 2 inches long, borne on peduncles about

6 inches long. The *Psoralea* is an old garden plant often grown under the erroneous name of *P. pinnata*. A native of South Africa, it is usually given greenhouse treatment, but in the garden of Mr. T. A. Dorrien Smith, at Tresco Abbey, Isles of Scilly, from whom the specimen figured was received, it flourishes out-of-doors and flowers in April.

Coco de Mer in British Guiana.—Through the courtesy of the General Secretary of the Linnean Society of London we are enabled to publish two interesting photographs of young Coco-de-Mer plants (*Lodoicea sechellarum*, Labill.), growing in the Botanic Gardens, Georgetown, British Guiana. The photographs, we learn from a letter sent by Mr. F. A. Stockdale, Assistant Director and Government Botanist, British Guiana, were taken by Mr. J. Williams, Assistant Government Analyst, at Mr. Stockdale's request. Short notices of the flowering of these palms have been published in the Reports of the Botanic Gardens, British Guiana, for the years 1906–07, p. 11; 1907–08, p. 10; 1908–09, p. 4. The photographs were sent to the Linnean Society with the following notes by Mr. Waby, Head Gardener, Botanic Gardens, Georgetown.

"The photographs exhibited represent two of three plants now growing in these gardens—one a female, the other a male, growing 24 feet apart; the third plant has not yet shown its sex.

"These three plants are all that survive of three dozen nuts imported from the Seychelles in the year 1893. The first dozen arrived dead; eight had germinated *en route*, and the others failed to germinate;—having passed by way of England during the winter was probably the cause of the failure. Of the second dozen four germinated in transit, and six did so afterwards, making ten which arrived in good condition; of the third dozen only five germinated. In 1898 eight were alive, but were reduced to six during the next year. In 1902 five remained, and two subsequently died, leaving only the three present plants.

"In March, 1907, the first spadix was produced with seven pistillate flowers, close to the ground. This plant was, therefore, not more than thirteen years old, making a record as against the 30 years stated in Lindley and Moore's "Treasury of Botany" as the time for the first flowers to be produced. Two more spadices were produced in the same year, two during the next, two more in 1909, and one this year.

"The small plant produced its first spadix in 1908, two more in 1909, and one this year, that shown in the photograph with a few developed flowers. One fruit of the fourth spadix is seen in the second photograph developing, like an enormous coco-nut, depressed ovoid in shape, 15 inches long, 12 inches wide, and 9 inches thick. Two others are also developing, conical in shape, 9 inches long, and 5 inches in diameter.

"The leaves are fan-shaped, 9–12 feet across the widest part, and about the same in length, with broad segments cut 2–3 feet deep, broadly V-shaped at the base; the leaf-stalks are very stout, 6–9 feet long.

COCO DE MER (*Female*).

[*To face page* 256.

Coco de Mer (*Male*).

[*To face page* 257.

"I believe these are the first plants of the genus to produce flowers in the western world."

We understand that Mr. Stockdale intends to prepare a paper giving the complete history of this Palm in British Guiana and of the efforts made by his predecessor, the late Mr. G. S. Jenman, for its introduction, together with Mr. Jenman's notes and later cultural notes by Mr. Waby.

Owing to the remarkable precocity of these plants, Mr. Stockdale's account will be awaited with interest. A paper on "Germination of the Double Coco-nut" has recently appeared in the "Annals of Botany" (Ann. Bot., xxiv., January, 1910, pp. 223–230), by Sir W. T. Thiselton-Dyer, in which reference is made to the flourishing young plant of *Lodoicea* in the Palm House at Kew.

The Subantarctic Islands of New Zealand.*—A general account of the expedition to the Southern Islands of New Zealand has already appeared in the pages of the Bulletin (*K.B.* 1908, pp. 237–249, with plates). The two reprints quoted above embody the scientific results of the expedition from the botanical side. Dr. Cockayne's article contains excellent reproductions of photographs of the characteristic features of the vegetation and deals with the types of vegetation found in the islands. The special ecology of the plants, their life forms and general biological features are first described and the plant formations of the Snares, Auckland Islands, Antipodes, and Macquairie Islands are then considered in detail. The ecology of Campbell Island is dealt with in a separate memoir by Mr. Laing, a copy of which has not yet reached Kew. The effect of animals on the vegetation, etc., is also discussed.

An ecological factor of prime importance in these islands is the climate: the temperature is equable and low, the sky is constantly cloudy with frequent rain and constant cold and violent winds. The soil is cold and abounds in humous acids, with the result that the vegetation is of a moorland character and shows marked xerophily owing to the physiological dryness of the substratum.

The 'forest vegetation' is represented by the Rata—*Metrosideros lucida* (*Myrtaceae*)—and among the trunks of these prostrate trees a refuge is found from the ever present gales. The effect of the environment on the vegetation is well marked not only in the position assumed by the trees and shrubs exposed to the full force of the wind, but also by the cushion or rosette forms so characteristic of the herbaceous vegetation. That such cushion forms are induced and not necessarily stable was shewn by a cushion of *Phyllachne clavigera* (*Stylidiaceae*), which when grown in a moist chamber produced elongated shoots and entirely changed its appearance. Details as to leaf anatomy, etc., are given, and it is

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* "The Ecological Botany of the Subantarctic Islands of New Zealand," by L. Cockayne, Ph.D., Article X.
"On the Systematic Botany of the Islands to the South of New Zealand," by T. F. Cheeseman, F.L.S., Article XIX., in "Subantarctic Islands of New Zealand," Wellington, N.Z., 1909.

pointed out that, as Schenck has already shown for Kerguelen Island, palisade parenchyma is often but feebly developed, apparently owing to the general cloudiness of the skies.

Certain features are identical in the different groups, namely the *Danthonia* (*Gramineae*) meadows or moors of the Auckland and Campbell Islands, the *Olearia Lyallii* (*Compositae*) formations of the Snares and Ewing Island, and the *Pleurophyllum Hookeri* (*Compositae*) formation of the subalpine zone of Auckland, Adams, and Campbell Islands. Space does not permit a review of the various formations in detail. The sand dunes, however, are remarkable in having no sand binding plant, *Scirpus frondosus*, though common in Stewart Island* and the Chatham Islands, being absent. In the Rata forest the conditions are very hygrophitic, and bryophytes abound and have in the long course of ages formed a deep deposit of peat. The forest passes insensibly into mountain scrub. The Pleurophyllums—of which some excellent figures are given—with *Stilbocarpa polaris* (*Araliaceae*) form one of the most striking associations of the islands, and probably represent, according to Cheeseman, the remnant of the ancient endemic flora of this region. Of introduced plants in the Auckland group, *Phormium tenax*, which is also naturalized in Campbell Island, appears to be making steady increase and invading the young forests.

Dr. Cockayne's memoir affords highly interesting and instructive reading, and conveys an excellent picture of the conditions of vegetation in the Subantarctic Islands.

Mr. Cheeseman treats of the botany of the islands from the systematic point of view. After giving a useful *resumé* of the geography of the islands, he recounts the history of botanical exploration among the islands from the year 1840 up to the departure of the expedition under consideration. A full enumeration of the Phanerogams, Ferns, and Lycopods then follows, with copious notes dealing with points of systematic interest and of geographical distribution. A tabular statement of the geographical distribution forms an excellent summary to the preceding pages. The concluding portion (pp. 453–471) of the memoir dealing with the "Affinities of the Flora, with suggestions as to its previous history," forms one of the most valuable contributions to Antarctic Botany since the publication of Sir Joseph Hooker's classical "Introductory Essay" to the "Flora Antarctica," to which Mr. Cheeseman acknowledges to the full his obligations.

The distribution of land and water in the Antarctic region is first described in connection with the question of the former extent of the Antarctic continent. This is followed by a catalogue of the Phanerogams and Ferns of Kerguelen and South Georgia, with their distribution in detail. The affinity of the flora with that of Fuegia is striking when it is realised that Kerguelen lies 4,000 miles from Cape Horn Following Schimper's views, recently published, it is pointed out that the endemic plants of Kerguelen probably

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* Stewart Island forms the subject of "The Report of a Botanical Survey," by Dr. Cockayne, recently published by the Department of Lands, New Zealand, which is illustrated by a large number of excellent pictures of the vegetation, and is of particular interest in connection with the Memoirs of the Southern Islands Expedition.

represent the remains of an ancient flora which managed to survive the glaciation of the island similar to that from which Heard Island is now emerging, and that the remainder of the flora with its Fuegian facies must be regarded as a recent immigrant, which, owing to the direction of the prevailing wind, has come from South America. Pelagic birds are regarded as the main agents in carrying the seeds, and it is pointed out in support of this view that most Kerguelen plants have seeds which permit of such a mode of transport. Certain Fuegian plants are found in New Zealand and the Southern Islands, and several of these also occur in Kerguelen. This, however, is not taken to indicate the possibility of a former great extension of the Antarctic continent, but rather points to the general circumpolar character of the Antarctic vegetation.

In the Southern Islands fifty-three endemic species are found, and some interesting notes are appended to each. Many of these are confined to a single island, which points to the relative antiquity and long isolation of the several islands. Two groups are distinguishable among the endemic plants—one of an ancient, the other of a more modern character, the latter showing fairly close affinity with New Zealand. Among the ancient types—including some thirty-two species—*Pleurophyllum*, *Stilbocarpa*, *Ligusticum* (*Umbelliferae*), *Celmisia* (*Ionopsis* section) are some of the most characteristic, and probably represent the relics of a former wide-spread flora. The more recent plants appear to be of the nature of immigrants from New Zealand, which have arrived after the separation of the islands. Thirdly, there is a small Fuegian element of recent origin, and not found in New Zealand, probably due to transport by pelagic birds. This includes *Ranunculus biternatus*, *Colobanthus subulatus* (*Caryophyllaceae*), and *Azorella Selago* (*Umbelliferae*).

It is suggested that *Cotula plumosa* (*Compositae*), and *Veronica elliptica* are really New Zealand or Southern Island plants which have been conveyed thence to Kerguelen and Fuegia respectively, and that *Sophora tetraptera* offers an analagous case as the seed pods may have floated from New Zealand to Chile and Juan Fernandez.

Our author then concludes that the flora of the Southern Islands, comprising 194 phanerogams and ferns, of which 133 species are common to New Zealand, is merely a branch of the New Zealand flora modified by a long period of isolation and that its history shews clear evidence of successive immigrations from New Zealand which overshadow in importance the few South American plants. The ancestors of these latter may have been derived from the Antarctic continent when it possessed a copious vegetation or, more probably, may have been carried by birds by way of South Georgia and Kerguelen. Mr. Cheeseman lays stress on the comparatively recent severe glaciation of the Antarctic region which he, no doubt rightly, holds responsible for the destruction of the ancient antarctic flora of the circumpolar area, but the remnants of which can still be seen in the remarkable *Pringlea* and perhaps also in *Lyllia* and *Colobanthus kerguelensis* of Kerguelen and in the *Stilbocarpa-Pleurophyllum* group of the Southern Islands.

A medicinal plant from British Columbia.—In November, 1907, Mr. J. F. Davison forwarded to Kew some roots of a plant collected by his father, Colonel Davison, in British Columbia. In the letter which accompanied the specimens, the following information is given. "I am sending some roots of a plant something between celery and carrot with which the Indians cure a sore throat. They chew a small piece about the size of a pea but do not swallow it . . . . I got these about 6,000 feet above sea level . . . . near a stream."

Colonel Davison, in a recent letter, informs us that the plant is called by the Indians "Tiu Piute." The root is also boiled to make a tea, and used by the Indians for fever. He adds that his guide had a very bad sore throat, and an Indian gave him some of the root to chew, which cured him.

The roots were collected high up the mountains above Kootenay Lake, near Mount Hooker, not far from Nelson.

The plant sent has recently flowered at Kew and has produced some fruit not fully mature. It proves to be a species of *Ligusticum* and possibly is *L. Canbyi*, Coult. and Rose, the only species of the genus recorded from British Columbia. Unfortunately, this species has not hitherto been represented in the Herbarium.

Para Rubber in Assam.—We have been informed by a correspondent that Para rubber (*Hevea brasiliensis*) has been successfully grown on an estate in Assam for the last four years. The plantation consists of some two to three hundred plants raised from seed on the spot. According to our correspondent "the estate is situated about four or five miles from Nazira in the Sibsagar District, on the Dekhu River just at the foot of the Naga Hills; the Naga path passes through it, and there used to be a guard stationed there some 25 years ago.

"Our manager at Behubar (that is the name of the garden) wrote in March, 1909, 'My Para rubber trees have got through the cold weather all right, they have nearly all shed their leaves which they are supposed to do when they are about four years old, and have already begun to throw out new shoots. I really think they will do all right from now on; the stems of some of them are quite 15 inches in girth,' and in December, 1909, on his return from leave in England, he writes 'The Para trees are looking very well and have put on a lot of growth this year and thickened out a lot. I am in hope some of them may seed next year. I wish we had more Para rubber and ready for tapping. I had no idea it would have done so well.'"

It is hoped that specimens from these trees may be received for examination.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1910.

XXXVII.—A VISIT TO THE ARNOLD ARBORETUM.

(With Plates).

W. J. Bean.

For many years past the most generous contributor of hardy trees and shrubs to Kew has been Professor C. S. Sargent, Director of the Arnold Arboretum, near Boston, U.S.A. It has long been known to us that in the establishment he controls there exists the richest collection in the world of the hardier North-east American and North Asiatic woody plants, and, with a view to ascertaining what was lacking in, and might be obtained for, the Kew collection, I was deputed by the Director to pay a visit to this establishment, and afterwards to see as much of the horticulture—especially the tree and shrub growth—of the surrounding country as was possible in the twenty days I remained there. I landed in Boston on June 16th, and sailed for home from New York on July 6th last. About half my time was spent in the Arnold Arboretum, and I also visited the public gardens of Boston, New York and Rochester, the Victoria Park on the Canadian side of Niagara, as well as some private gardens of repute in the neighbourhood of Boston and New York.

I have to acknowledge my indebtedness to Professor Sargent not only for many courtesies received whilst I stayed in the Arnold Arboretum, but also for using his good offices to make my visits to other establishments easier and more profitable.

History and Origin.

The Arnold Arboretum extends over some 220 acres and is situated in Jamaica Plain, one of the suburbs of Boston, easily reached from any part of the city by electric tramcars. It owes its name and origin to Mr. James Arnold, a wealthy merchant of New Bedford and a member of a well-known Quaker family, who, about the year 1870, left 100,000 dollars "for the promotion of agricultural or horticultural improvement." One of the trustees of this fund was Mr. George B. Emerson, the author of the well-known work

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on the "Trees and Shrubs of Massachusetts," and largely through his efforts and influence, Harvard University was induced to devote 125 acres of some lands belonging to it, known as "Bussey Farm," to the purpose of forming an arboretum. Ultimately the fund grew to 150,000 dollars and a chair of arboriculture with Professor Sargent as its first occupant was instituted in 1873. The area has since been added to by some 90 acres.

The income from 150,000 dollars was a small sum with which to make and carry on an arboretum of the dimensions contemplated, yet with this Professor Sargent was expected to develop over 120 acres into a scientific garden and without (as he observes) a library, or collection of plants, public interest or support to begin with. Difficult as the task was, it has been accomplished, and the Arnold Arboretum is to-day a remarkable monument to the hard work, perseverance, diplomacy and skill of one man. Since its foundation Professor Sargent has raised some 1,200,000 dollars (chiefly, I believe, from private sources) to develop and maintain the institution, and his aim is to secure an endowment fund of at least 1,000,000 dollars to carry it on in permanence. Considering the work the Arboretum has done and is doing, that sum seems a very modest one and, in a country so rich as the United States in public-spirited men, will no doubt be obtained. Besides an incalculable amount of work, Professor Sargent himself has given his books, illustrations and herbarium to the Arboretum—a princely gift, for it forms the bulk of a library now consisting of 23,000 volumes, all of which deal in greater or less degree with the woody vegetation of the globe.

The aim of the establishment is to provide facilities for the study of the trees and shrubs of the whole world, but especially those of North America. A handsome building, known as the Museum, was built in 1892, mainly at the cost of the late Mr. H. H. Hunnewell of Wellesley ; and recently an extension of it has been erected at a cost of £8,000. The older part is now used to hold the library, and to provide offices for the members of the staff. The newer portion houses the herbarium and consists of four storeys fitted with air-tight steel cabinets sufficient to hold 1,000,000 sheets. These steel cases reach from the floor to the ceiling so that there can be no accumulation of dust above them, and they are a great improvement on the common wooden ones of the older herbaria, as they are fire-proof, economise space and do not warp or admit dust. They are, of course, much more costly. On the ground floor of the Museum there is a fine collection of specimens of North American timbers, which are part of the famous Jesup collection, the main portion of which is now exhibited in the Natural History Museum at New York. In an adjoining room there is an excellent collection of the fruits of Coniferae. Many of these, especially the cones of firs, spruces and pines are too large and bulky to be accommodated on the shelves of ordinary cabinets and are here arranged in drawers.

The herbarium is under the immediate charge of Mr. C. E. Faxon, Professor Sargent's co-worker and the most famous of American botanical artists. He made the illustrations for the great *Silva of North America*, for the *Manual of the Trees of North America*, and was the regular artist for *Garden and Forest* as he is now for *Trees and Shrubs*.

Beauty of Landscape.

To one who enters the Arboretum for the first time the most striking impression received is that of its great beauty of landscape. Only a very small proportion of its area is level, and at several points it swells into bold prominences such as Peter's Hill, Bussey Hill and Hemlock Hill. The last-named is, indeed, the most remarkable part of the grounds. It is a steep hill with outcropping rock and almost precipitous on one side, covered with a primeval growth of "Hemlock"—the American name for *Tsuga canadensis*. Some of the older trees are splendid examples. I measured one over 9 feet in girth of trunk. It is a peculiarly fortunate circumstance that this wood should have been preserved to a public body in whose hands its continued existence is assured, for but little of the primeval forest of the New England States remains untouched, and the fact that this tract is almost within the confines of a large city makes it doubly precious. At its northern base a brook finds its exit from the grounds after having traversed them in various phases and makes a charming feature; especially where it has passed through a flowery meadow, the gully it has worn out fringed with native vegetation, amongst which, at the time I saw it, the elderberry (*Sambucus canadensis*) made a pretty display.

To the top of the sister prominence, Bussey Hill, a carriage drive has been made, and from this point a great expanse of beautiful country can be seen, especially the rolling outlines of the Blue Hills in the far distance.

Another beautiful feature of the Arboretum, and one which makes a special appeal to the foreigner, is the native undergrowth. In place of the lawns and grass which cover so much of the ground in English gardens and parks, there is here a very interesting ground-covering consisting of native plants, amongst which are various species of Vaccinium, Aster, Rubus, golden rod and Asclepias, *Baptisia tinctoria*, *Comptonia asplenifolia* and the poison ivy (*Rhus Toxicodendron*). Very abundant in places—for it has thoroughly naturalised itself—is the European dyer's greenweed (*Genista tinctoria*) making a gay display in early July. Springing up freely every year amongst this low growth is a crop of seedling oaks and hickories so numerous that, in view of the needs of the exotic trees, they have to be mainly treated as weeds. Professor Sargent finds that this low ground-cover is not only more beautiful and interesting than meadow, but it is also much more favourable to tree growth. It keeps the earth shaded and cooler than a covering of turf, and does not rob the ground of moisture so much. With the crowds that visit Kew a general treatment of the ground in this way would be impossible, but we have found that for trees rare and difficult to grow, a ground cover of heath is very advantageous, providing shade and shelter for the roots and stem without unduly robbing the soil.

In the more secluded hollows and glades Professor Sargent is developing a rich growth of ferns and shade-loving plants.

Another feature in the landscape of the Arnold Arboretum is the artistic treatment of the walks and boundary walls. Unlike Kew, the grounds are open to horse-drawn carriages (not motors) and are traversed by a system of broad, finely planned roads, which were

made and are maintained by the Park department of the city of Boston. (It may here be mentioned that in maintaining these roads, in providing police protection, and in holding the property for ever free of taxes, Boston does something towards the support of the most beautiful of its open spaces). On each side of the road and separated from it by a few feet there is a path for foot traffic. A triple track of this kind is not, of course, in itself an object of beauty, but by planting the space between the carriage drive and the footpath with a varied shrubby growth which provides usually a low irregular fringe to the footpaths, but sometimes is high enough to seclude them entirely, Professor Sargent has given them a singular charm. Through the wilder parts of the grounds grassy ways have been made which are kept closely mown to the width of a single cut of a mowing machine. Winding through the tree collections or across the hill slopes they provide the pleasantest of walking tracks.

The Arboretum is surrounded by a low wall of stone which makes an effective boundary, but is not at present high enough to exclude trespassers—as it is hoped eventually to make it. This wall is covered with a variety of climbing plants, amongst which the species of Clematis, Vitis and Celastrus are most conspicuous. These plants, which are pruned back annually in spring, had, by the time of my visit, about hidden the walls in a beautiful tangle.

The Collections.

It would, of course, be impossible to give any detailed mention of the collections of trees and shrubs. In a general way they are extremely rich in North-east American and North Asiatic species, but comparatively weak in European and West North American, whilst the floras of New Zealand and South America are scarcely, if at all, represented.

To one who has never been out of Europe before the perfect development of the native American trees naturally appeals most strongly. Especially does one admire the splendid full-grown hickories, only known as comparatively small trees in this country; the various white oaks which do not thrive at all with us, and especially the beautiful plumose branching and shapely form of the sugar maple, rarely or never seen in perfection here.

The climate of Boston, judging by its vegetation, bears about the same relation to the British Isles as that of Central Europe. The summers are much brighter and hotter; the winters much colder. In consequence, deciduous trees and shrubs flower with much greater certainty and freedom than they do in Britain, they bear fruit more plentifully, and the colouring of the decaying foliage in autumn is richer than anything ever even suggested in our climate. The climatic conditions of Boston are evidently very favourable to the growth as well as the flowering of many North Asiatic trees and shrubs. The oaks, for instance, introduced by Professor Sargent from Japan 20 years ago, such as *Q. crispula*, *Q. glandulifera*, and *Q. grosseserrata* have made splendid progress and are

KALMIA LATIFOLIA.

[*To face page 265.*]

proving admirable trees. *Cercidiphyllum japonicum* which at Kew, owing to its young growth being cut back by frost once or twice every spring, has never got beyond the dimensions of a scrubby bush, is in the Arnold Arboretum represented by several vigorous cleanly-grown trees 30 to 40 feet high. The bush honeysuckles (*Lonicera*) have a value as ornamental fruiting shrubs beyond anything we ever experience. By the latter part of my stay in Boston many of them had become covered with crops of fruit beautiful in their abundance and in the translucence of their red, yellow or other colouring.

Perhaps the most noticeable difference between the general aspect of the vegetation of the Arnold Arboretum and that of English gardens is the absence of our common evergreens. Neither the holly, the yew, the ivy, the aucuba, nor the box appears to be genuinely hardy, and only a small proportion of our garden varieties of Rhododendron succeed well. The Chilian *Berberis Darwinii*, the New Zealand veronicas, the bay laurel, *Magnolia grandiflora*, the arbutuses are all too tender to be grown in the open. In the matter of evergreens as a whole English gardens have much the advantage.

Kalmia latifolia.

On the other hand such conifers and flowering evergreens as are hardy thrive exceedingly well. One of the great annual displays of the Arnold Arboretum is made by *Kalmia latifolia*. When I landed in Boston on June 16th, this shrub was in its full beauty both here and in the grounds of Professor Sargent's residence at Holm Lea. In the Arnold Arboretum it covers a sloping bank at the northern base of Hemlock Hill, forming an irregularly disposed mass perhaps 200 yards in length and 10 to 20 yards wide. There is considerable variety in the size and depth of shade of the blossom, and in the density of the flowers in the truss. With the dark masses of hemlock in the background the whole made a picture of exceeding beauty [*see* Plate]. No European visitor in the neighbourhood of Boston in mid-June should miss the sight of this splendid bank of Kalmia. Its beauty both in Professor Sargent's garden and in the Arnold Arboretum would seem to show that this shrub, although long introduced and well known, has either been neglected in Britain or that our climate generally is not so well adapted for it as it is for most evergreens. It would appear, however, that the former is the case as they are some very fine specimens in the South of England.

The botanical collection of shrubby plants is arranged in a series of long parallel borders, each border being about 8 or 10 feet wide and separated from the next by a grass walk. The shrubs are brought together in their respective genera and natural orders and there is only a single row of plants down the centre of the border. This allows each plant to stand on its own ground without interference from its neighbour, and the convenience of the student is further aided by each specimen having a label on either side. The general idea is somewhat similar to that of the arrangement of the

herbaceous plants at Kew. Considered as part of the landscape this system is not beautiful, especially in the early stages, when the plants are not fully grown and bare spaces yet await their destined occupants. But for purposes of botanical study no other arrangement is so convenient.

The collections of trees are, of course, spread over the Arboretum generally, the earlier natural orders (in the Bentham and Hooker sense) being planted at the eastern portion of the grounds near the Museum. A special consideration is paid to American trees that reach timber-producing size. With these the system is to plant (first) a number of specimens in a group close enough to develop trunks instead of side branches and thus show their timber value; and (second) a single specimen at a distance of not less than 100 feet from its companion group. This is to show its value as an isolated tree for gardens, parks, &c. [*See* Plate.]

American Thorns.

One of Professor Sargent's great tasks for some years past has been the elucidation of the North American Crataegi. It has involved an enormous labour but during the course of it he and his co-workers have been able to introduce to cultivation many new, very distinct and beautiful species. A number of dwarf bushy species are of particular interest to planters because their low, almost shrubby habit makes them suitable for places where the older thorns, from considerations of space, could not previously be grown. About fifteen acres on the eastern slope of Peter's Hill have been devoted to the type collection of American thorns. The plants have been raised from the type trees of each species and every plant has its place defined on a plan of the site, so that, in case of loss of label, its identity would be recoverable. From ten to twenty years must elapse before this collection reaches its best, but it will eventually constitute probably the most remarkable assemblage of members of a single genus in the world.

It was too late in the season to see the flowering of the rich and well-grown collection of garden varieties of lilac, but *Syringa japonica*, the noblest of the genus and a tree here over 30 feet high, was very striking in the profusion of its large pyramidal panicles of white blossom. Even with us it is a very useful small tree because of its late flowering, but it is one of the instances already alluded to where North Asiatic deciduous trees thrive much better in places where the summers are hotter than ours.

One of the great annual displays of blossom in the Arboretum is made by *Rhododendron Kaempferii*, a Japanese ally of *R. indicum* but very hardy, introduced by Professor Sargent less than 20 years ago. This and most of the other azaleas were past before my visit, but I was fortunate to find *R. arborescens*—an azalea native of the Eastern United States—fully in flower. Its flowers are white with long red stamens, and its charm is heightened by a most gracious perfume. It is curious that it is scarcely known in British gardens.

ULMUS RACEMOSA.

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Several notable hybrid roses have appeared in the Arboretum raised by Mr. Jackson Dawson. Mr. Dawson has, like Professor Sargent, seen, and helped in, the development of the Arboretum since its inception, and in regard to the outdoor department he has in a great measure played the part of builder to that of the Professor's architect. Trees now 60 feet high, he himself raised from seed, or collected as seedlings in the forests. Gifted with that peculiar understanding of plant life which enables its possessor to divine by intuition the treatment best suited to his charges and the happiest devices for increasing their number, Mr. Dawson has done much by his genius as a propagator towards making the collections so rich as they now are. He was about the first to recognise the value of *Rosa multiflora* and *R. Wichuraiana* for hybridising, and such fine roses as The Dawson, Lady Duncan, E. C. Egan and Arnoldii are the products of his skill.

I was fortunate to see a new rose in flower which Mr. Dawson has raised and called "Professor C. S. Sargent." The original plant raised in 1903 is now 8 feet high and 9 feet through, a sturdy bush with splendidly vigorous foliage. It bears large flattish trusses of semi-double flowers 3 inches across, of a delicate, apple-blossom shade, and from 30 to 50 in a truss. In June it was carrying thousands of flowers—a wonderfully beautiful picture. Its parentage is as follows: pollen bearer "Baroness Rothschild"; seed-bearer an unnamed hybrid between *R. Wichuraiana* ♀ and "Crimson Rambler" ♂. In this interesting combination the influence of *R. Wichuraiana* is only seen in the very glossy, thick, dark green foliage.

What the Arboretum has done.

From what has been said it will have been gathered that the Arnold Arboretum is filling a very important part in the advancement of arboriculture in North America and Europe. Being in one respect part of the park system of Boston, it provides a very beautiful place of resort for the people of that city. It provides also many lessons in landscape art, for there is evidence that every aspect of the grounds has been the subject of careful study in that respect. While the scientific side of the establishment necessarily dominates all others, the natural beauties of the site have not only been preserved but greatly enhanced.

Considered from the practical side, as apart from pure botany, perhaps the most notable work it has done has been the popularisation and dissemination of American trees and shrubs. Before its foundation, American gardens appear to have mainly depended for their ornamentation on plants of European origin. As an instance, I was told that 30 to 40 years ago one could not have purchased one hundred American oaks in American nurseries. The flora of the East United States has given an extraordinary number of beautiful trees and shrubs to English gardens, and in the latter half of the 18th century and the beginning of the 19th their introduction and cultivation was the chief interest of the most ardent horticulturists of the period. Many of the shrubs then introduced disappeared in course of time, and the Arnold Arboretum has done

much good work in re-introducing them. Such shrubs as *Vaccinium hirsutum*, *Rhododendron arborescens*, *Gaylussacia brachycera*, *Kalmia cuneata* and *Fothergilla major*, are a sample of the many delightful plants which have in this way been restored to us. Many quite new species have also been introduced to cultivation, whilst others, long known but rare, have been made more plentiful.

Next to the woody vegetation of his own country Professor Sargent has given most attention to that of Northern Asia. He himself has enriched American and European gardens with numerous trees and shrubs collected in Japan in the early "nineties." It would need too much space to enumerate half the things introduced through him and the institution he controls. But amongst them the following are especially noteworthy:—*Syringa japonica* and *S. pekinensis*, *Cercidiphyllum japonicum*, *Phellodendron sachalinense*, *Rhus trichocarpa*, the typical *Prunus triloba*, *P. Sargentii* and *P. subhirtella*, the oaks mentioned above, *Picea Glehnii*, *Betula Maximowiczii*, *Rhododendron Kaempferii*. On behalf of the institution in its relationship to Harvard University, two collectors, Messrs. Wilson and Purdom, are now travelling in China, and the former had previously spent two or three years there in the same work.

Whilst my object has been to indicate as briefly as possible what the Arnold Arboretum is and what it does, and to show that it is an institution which Harvard University and the City of Boston in particular, and the United States in general, have every reason to cherish and be proud of, I should not conclude without a few words in appreciation of the remarkable man who has made it, to whom it owes its splendid efficiency, and on whom its continued existence as a scientific institution has largely depended. Among the numerous qualities that are needed to make the perfect Director of a large public garden there are three that stand out as peculiarly essential. As a matter of course he should have great scientific attainments, and in these days he needs also a keen perception of landscape beauty; finally he must possess the business faculty. To few have these attributes been given in so full a degree as to Professor Sargent. No one has done a tithe as much for the advancement of knowledge in regard to North American trees and shrubs, and although now in advanced middle age, he still retains an untiring mental and physical energy. A great traveller, he has seen all but a few of the North American trees growing in their natural haunts. He has also introduced many valuable North Asiatic trees to America and thence to Europe. Free from the common craze of the collector for exclusive possession, his desire is that the plants he introduces should become widely diffused in gardens, and the limits of his generosity appear to be set only by the possession of a single plant of a kind.

The literary work of Professor Sargent commenced with the publication of the IXth Volume of the *Tenth Census of the United States* which contained a catalogue of the Forest Trees of North America, amplified by various particulars in regard to habitat, uses, sizes, &c. From 1888 to 1897 he published a weekly journal devoted to forestry and horticulture—*Garden and Forest*—which

was probably too much in advance of its period in America to be a financial success, but whose ten volumes are a mine of reliable information, especially in regard to trees and shrubs. In 1894 was published the *Forest Flora of Japan*, the outcome of Professor Sargent's travels in Japan a year or two previously.

His greatest work, however, and the one on which his literary fame will most endure, is the *Silva of North America*, a magnificent work in quarto of 14 volumes, giving one or more portraits, a description, and much historical and other information about every tree of timber-producing size in North America exclusive of Mexico. A very successful work is the *Manual of the Trees of North America*, to some extent an abridgment of the *Silva*.

At the present time there is being issued at intervals a quarto publication called *Trees and Shrubs* giving illustrations and descriptions of new or little known ligneous plants. Since the publication of the *Silva*, however, the most laborious undertaking under the auspices of Professor Sargent and the Arnold Arboretum is a complete *Bibliography of the Trees and Shrubs of the World* up to 1900, which is now in the hands of the printer. This work will consist of four quarto volumes and will run to 4000 pages. It gives all references to the published literature of any value in all languages dealing with the woody plants of the globe. By its means the student will be furnished with a complete guide to all the authoritative printed information about any known tree or shrub up to the beginning of the present century.

Explanation of Plates.

I.—A flowery meadow, with *Kalmia latifolia* in blossom, and a spur of Hemlock Hill covered with *Tsuga canadensis* in the background.

II.—The Rock Elm (*Ulmus racemosa*), showing the system of planting a number of specimens of one species in a group with a single isolated one 100 feet or more away.

XXXVIII.—NEW IMPATIENS FROM CHINA.

J. D. Hooker.

In April of the present year Prof. C. S. Sargent, Director of the Arnold Arboretum, Boston, U.S.A., placed in my hands for examination and subsequent transference to the Herbarium of the Royal Botanic Gardens, Kew, ten species of *Impatiens* found by the celebrated traveller and collector Mr. E. H. Wilson in China, during his second botanical mission to that country in 1908. Of these the following six are new to me, raising the number of Chinese species

of which I have MSS. or published descriptions to upwards of one hundred and seventy.

Clavis specierum novarum.

(*Folia in omnibus alterna; inflorescentia pedunculata; labellum calcaratum*).

Pedicelli omnes basi bracteati.
  Sepala 2.
    Alarum auricula dorsalis normalis vel 0.
      Pedunculi pluriflori; vide etiam no. 7, *I. desmantha*.
        Folia 1–2 dm. longa; flores majusculi, flavi; sepala plana, distorta, apice hilo instanti; antherae acutae. 1. *I. tortisepala*.
        Folia 4–8 cm. longa, breviter petiolata; flores parvi, straminei; sepala ovato-rotundata, obtusa; antherae acutae. 2. *I. microstachys*.
      Pedunculi 1-flori, brevissimi; vide quoque no. 9, *I. pterosepala*.
        Folia 6–10 cm. longa, longe petiolata, grosse crenata; sepala orbicularia; alarum lobus basalis longe cuspidatus. 3. *I. brevipes*.
    Alarum auricula dorsalis filiformis, calcare labelli inclusa; vide quoque no. 10, *I. Faberi*.
      Folia 5–10 cm. longa; pedunculi 2-flori; flores rosei; sepala late ovata; labelli calcar breve; antherae acuminatae. 4. *I. distracta*.
  Sepala 4.
    Folia 3–4 cm. longa, ovata, serrulata; flores majusculi, roseo-purpurei; sepala exteriora lineari-lanceolata; labellum inflatum. 5. *I. gasterocheila*.
Pedicelli medio tantum bracteati; vide quoque no. 8, *I. corchorifolia*.
  Folia 3–5 cm. longa, oblonga, crenata, basi rotundata vel cordata; flores parvi, rosei; bracteae orbiculares, sessiles, dentatae, persistentes; antherae acutae. 6. *I. latebracteata*.

1. **I. tortisepala**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Huang Yah, alt. 1500–1800 m., locis humidis, *E. H. Wilson* in Herb. Arnold Arboret., no. 3061, et Kew.

Herba elata, glaberrima, grandifolia, mediocriflora, caule ramoso. *Folia* 1–2 dm. longa, alterna, submembranacea, oblonga vel ovato-oblonga, acuminata, crenata setulis interjectis 0, basi rotundata, serrata, utrinque 6–7-nervia, costa nervisque gracilibus; glandulae infrapetiolares 0. *Inflorescentia* pedunculata; pedunculi 6–7 cm. longi, suberecti, 6–8-flori; pedicelli florentes 3–4 cm. longi, fructiferi patuli, paullo longiores; bracteae subulatae, 2–4 mm. longae. *Flores* ad 4 cm. expansi, flavi; raphides 0. *Sepala* 2, reniformi-rotundata, plana, torta, apice nunc producta hilum fere attingente, 5 mm. diametro, membranacea. *Vexillum* rotundato-reniforme, 1·5 cm. latum, costa dorso carinata apice rostellata. *Alae* 2–2·5 cm. longae, late stipitatae; lobus basalis parvus, rotundatus, breviter calcaratus, distalis ter longior, dolabriformis, apice rotundatus; auricula dorsalis parva, inflexa. *Labelli* limbus saccatus, ad 2 cm. longus, in calcar robustum incurvum apice

clavatum abrupte attenuatus, ore ultra medium ascendente erecto acuto. *Filamenta* brevia, lata ; antherae ovatae, acutae. *Ovarium* fusiforme, rectum, acutum. *Capsulae* lineares, 4–5 cm. longae, rectae, acutae, polyspermae. *Semina* oblonga vel obovoidea, compressa, 4 mm. longa, laevia, castanea.

A handsome species the curious sepals of which can only be described as more or less broadly reniform, being curved in a plane with the stoutly beaked apex lateral or close to the hilum. More specimens will probably show great variability in the sepals.

2. **I. microstachys**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Huang Yah, alt. 1500–1800 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3067, et Kew.

Herba gracilis, glaberrima, parviflora, caule laxe ramoso. *Folia* 4–8 cm. longa, alterna, breviter petiolata, firma, ovata vel ovato-oblonga, acuminata, crenata vel crenato-serrata, basi acuta, utrinque 6–7-nervia, petiolo 0·5–1·5 cm. longo nudo vel 1–3-glanduloso ; glandulae infrapetiolares 0. *Inflorescentia* pedunculata ; pedunculi foliis subaequilongi vel longiores, filiformes, patuli vel decurvi, 3–5-flori, subflexuosi ; pedicelli florentes 0·5–1 cm. longi, fructiferi duplo longiores ; bracteae minimae, setaceae. *Flores* vix 1 cm. expansi, pallide flavi ; raphides 0. *Sepala* 2, ovato-rotundata, obtusa, membranacea, 5-nervia. *Vexillum* orbiculare, ad 6 mm. diametro, utrinque intrusum, costa gracili mutica. *Alae* breves, sessiles, ad 5 mm. longae et latae ; lobus basalis rotundatus, distalis paullo minor ; auricula dorsalis 0? *Labellum* 1·3–1·5 cm. longum ; limbus subinfundibuliformis, in calcar limbo triplo longius apice incurvum sensim attenuatus, ore horizontali acuto. *Filamenta* linearia ; antherae acutae. *Ovarium* fusiforme, rectum, acuminatum, 5-gonum. *Capsulae* erectae, 2 cm. longae, lineares, rectae vel lente curvae, acuminatae, 5-gonae, 5-spermae. *Semina* ellipsoidea, 3–3·5 mm. longa, glabra, fusco-castanea, nitida.

3. **I. brevipes**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Wa-shan, alt. 1500–1800 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3059, et Kew.

Herba glaberrima, 5 dm. alta, paucifoliata, floribus mediocribus, caule simplice inferne longe nudo robusto superne remote foliato. *Folia* 6–10 cm. longa, alterna, longe graciliter petiolata, membranacea, ovata, caudatim acuminata, grosse crenata setulis interjectis 0, basi rotundata vel cuneata, nuda vel glandulifera, petiolo 3–5 cm. longo, nervis utrinque 5–7 ; glandulae infrapetiolares 0. *Inflorescentia* pedunculata, pedunculo brevissimo unifloro, bractea subulata. *Flores* ad 3 cm. expansi ; raphides 0. *Sepala* 2, orbicularia, 1·2 cm. diam., 7-nervia, costa carinata cuspidata. *Vexillum* orbiculare, fornicatum, costa dorso ala lata instructa mutica. *Alae* late stipitatae, 2·7 cm. longae ; lobus basalis orbicularis, in cuspidem elongatum crispatum angustatus, totus 4 cm. longus, distalis duplo major, late dolabriformis ; auricula dorsalis magna, inflexa. *Labelli* limbus infundibularis, 3 cm. longus, in calcar limbo dimidio brevius incurvum alte fissum attenuatus, ore lato ascendente acuminato. *Filamenta* brevia ; antherae didymae. *Ovarium* angustum, strictum, acuminatum, 5-gonum.

Described from a single specimen which may not represent the normal habit of the plant, together with a single expanded flower. The structure of the basal lobe of the wings with its long acuminate crisped apex is that of the N. Chinese and Japanese *I. Textori*, in which the peduncle is many-flowered.

4. **I. distracta**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Huang Yah, locis humidis, alt. 1500–1800 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3060, et Kew.

Herba fere glaberrima, gracilis, ramosa, floribus inter minores, ramis elongatis. *Folia* 5–10 cm. longa, apices versus ramorum conferta, sessilia, inferiora alterna, petiolata, membranacea, ovato-oblonga, acuminata, crenata vel crenato-serrata setulis interjectis 0, suprema basi rotundata, inferiora basi cuneata petioloque gracili 3–4 cm. longo instructa; nervi utrinque 6–7, graciles; glandulae infrapetiolares 0. *Inflorescentia* pedunculata; pedunculi graciles, 2–3 cm. longi, biflori, glabri, pilosuli; pedicelli florentes breves, fructiferi divaricati, 0·5–3 cm. longi, inferior basi, superior supra basin bracteati; bracteae lanceolatae, 3–5 mm. longae. *Flores* ad 2 cm. expansi, roseo-purpurei; raphides 0. *Sepala* 2, ovata, cuspidatim acuminata, 7 mm. longa, 3-nervia, glabra vel pilosa. *Vexillum* orbiculare, 1·4 cm. diametro, basi intrusum, apice rotundatum, costa dorso late alata, ala apice rostrata. *Alae* sessiles, 2–2·5 cm. longae; lobus basalis parvus, rotundatus vel decurvus, ambitu purpureus, distalis multo major, dolabriformis, dorso infra apicem saepe late excisus; auricula dorsalis in filum lamina dimidio brevius in calcar labelli descendens productus. *Labelli* limbus cymbiformis, ascendens, 1·5 cm. longus, acutus, basi in calcar crassum obtusum paullo incurvum limbo brevius attenuatus. *Filamenta* brevissima, lata; antherae subacutae. *Ovarium* fusiforme, rectum, acutum. *Capsulae* lineares, 3–4 cm. longae, teretes, acuminatae, rectae vel falcatae, polyspermae. *Semina* ovato-oblonga, 3·5–4 cm. longa, glabra, fusca.

Closely allied to *I. Faberi*, but differing in the short spur and dorsal auricle of the wings, 2-flowered peduncle, &c.

5. **I. gasterocheila**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Wa-shan, secus rivulos, alt. 900 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3062, et Kew.

Herba gracilis, glaberrima, 4 dm. alta, mediocriflora, caule subsimplici inferne longo nudo. *Folia* 3–4 cm. longa, alterna, longe petiolata, membranacea, ovata, acuminata, serrulata, basi cuneata in petiolum gracilem 2–3 cm. longum breviter angustata, costa nervisque utrinque 6–7 tenuibus; glandulae infrapetiolares 0. *Inflorescentia* pedunculata; pedunculi graciles, uniflori, florentes 1–1·5 cm. longi, fructiferi duplo longiores; bracteae paucae, sparsae, capillares, 1–3 mm. longi. *Flores* ad 2 cm. expansi, roseo-purpurei; raphides 0. *Sepala* 4, uninervia, 2 exteriora lineari-lanceolata, 7 mm. longa, longe acuminata, 2 interna basi vexilli opposita, 4 mm. longa, linearia, acuta. *Vexillum* orbiculare, fornicatum, 1·2 cm. diametro, costa dorso anguste alata mucronata. *Alae* late stipitatae, 1·8–2 cm. longae; lobus basalis oblongus, subacutus, distalis dimidio longior, obovato-oblongus; auricula dorsalis parva, inflexa. *Labellum* inflatum,

incurvum, 1·5 cm. longum, calcare brevi erecto instructum, ore scaphiformi, horizontali, longe acuminatum. *Filamenta* brevia, linearia ; antherae majusculae, didymae. *Ovarium* fusiforme, strictum, acuminatum. *Capsulae* erectae, lineares, 2 cm. longae, utrinque acuminatae, strictae, oligospermae. *Semina* late ovoidea vel globosa, compressa, 2·5 mm. longa, laevia, fusca.

A very singular species, with rose-purple flowers difficult of analysis and description. The very slender one-flowered peduncles may easily be mistaken for simple pedicels, so small are the capillary bracts. The incurved inflated tip is of the saccate type and probably varies greatly in form.

6. **I. latebracteata**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Huang Yah, locis humidis, alt. 1200–1800 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3066, et Kew.

Herba elata, gracilis, glaberrima, caule ramoso ramisque distanter foliatis. *Folia* 3–5 cm. longa, alterna, suprema sessilia, firma, oblonga vel ovato-oblonga, obtusa, crenata setulis interjectis 0, basi rotundata vel cordata, nervis utrinque 6–7 costaque gracillimis, petiolo 0·5–3 cm. longo gracili ; glandulae infrapetiolares 0. *Inflorescentia* pedunculata ; pedunculi foliis breviores, graciles, 2–5-flori ; pedicelli 0·5–1 cm. longi, medio bracteati ; bracteae orbiculares, sessiles, 3–4 mm. diametro, dentatae, persistentes. *Flores* ad 1 cm. expansi, flavi ; raphides 0. *Sepala* 2, late ovata, obtusa, 6–8 mm. longa, inaequilatera, membranacea, 4–5-nervia. *Vexillum* orbiculare, fornicatum, dorso tumidum, muticum. *Alae* sessiles, 1·5–1·7 cm. longae ; lobus basalis rotundatus vel late oblongus, distalis triplo major, dolabriformis, apice rotundatus ; auricula dorsalis inflexa. *Labellum* infundibulare, ab ore subhorizontali sensim attenuatum, totum incurvum, ad 2 cm. longum. *Filamenta* brevissima, lata ; antherae late ovatae, acutae. *Ovarium* fusiforme, acuminatum, rectum. *Capsulae* 1·5–2 cm. longae, erectae, anguste ellipsoideae, utrinque attenuatae, acutae, oligospermae. *Semina* oblonga vel obovoidea, 4–4·5 mm. longa, fere laevia, fusco-castanea.

The remarkably large, orbicular, sessile, toothed bracts on the middle of the pedicels are totally dissimilar to those of any other Asiatic species known to me.

The following four species in Mr. Wilson's collection were known to me from specimens obtained by earlier travellers ; they are :—

7. **I. desmantha**, *Hk. f.* in Nouv. Archiv. Mus. Hist. Nat. Paris, ser. 4. x. (1908) 248.

SZECHUAN OCCIDENT. Tatienlu bor. orient., locis humidis, alt. 2280 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3056, et Kew.

Primum in sylvis San-tcha-no prov. Yunnan ab *Abbate Delavay* detecta ; recentius in Mont. Tali alt. 2400–2700 m., a *G. Forrest*, no. 4274 et in Mont. Lichiang, alt. 2850–3300 m. collecta.

The Szechuan specimens have longer points to the leaves than those from Yunnan.

8. **I. corchorifolia**, *Franch.* in Bull. Soc. Bot. France xxxiii (1886), 443 ; Hk. f. in Nouv. Archiv. Mus. Hist. Nat. Paris, ser. 4, x. 261.

SZECHUAN OCCIDENT. Wa-shan, alt. 1500–1800 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3064, et Kew.

Primum in sylvis montis Ki-chan, prope Tali, alt. 2800 m., ab *Abbate Delavay*, no. 1149, detecta; recentius ab *Aug. Henry*, no. 11,304, et *G. Forrest*, no. 601, collecta.

9. **I. pterosepala**, *Hk. f.*, sp. nov.

HUPEH OCCIDENT. Heang-shan, alt. 1200 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3068, et Kew.

Praevius in Hupeh ab *Aug. Henry*, no. 6551 et no. 7419, et *E. H. Wilson*, no. 2692, collecta.

Herba 6–9 dm. alta, gracilis, ramosa, glaberrima, floribus inter minores. *Folia* 3–10 cm. longa, alterna, membranacea, ovata, acuminata, serrata vel crenato-serrata, basi acuta et saepissime glandulis 2 magnis globosis aucta, in petiolum nudum vel glandulosum gracile 1–3 cm. longum angustata, nervis utrinque 5–7; glandulae infrapetiolares 0. *Inflorescentia* pedunculata; pedunculi 2–3 cm. longi, graciles, uniflori; bracteae solitariae, setaceae. *Flores* 2–2·5 cm. expansi, roseo-purpurei; raphides 0. *Sepala* 2, anguste ovata vel ovato-oblonga, subacuta, 6–7 mm. longa, inaequilatera, nunc uno latere minute denticulata, costa dorso crasse alata. *Vexillum* orbiculare, 1·2 cm. diametro, fornicatum, basi bilobum, apice muticum, costa dorso late vel anguste alata, ala integra vel biloba. *Alae* subsessiles, 1·5 cm. longae; lobus basalis parvus, oblongus vel subquadratus, distalis multo major, dolabriformis, vel semilunaris, nunc 1·4 cm. latus, apice rotundatus; auricula dorsalis brevis vel elongata, inflexa. *Labellum* corniforme, ad 2–2·5 cm. longum, ab ore ascendente acuto sensim attenuatum. *Filamenta* linearia; antherae didymae, obtusae. *Ovarium* fusiforme, rectum, acutum, 5-gonum. *Capsulae* anguste lineares, erectae, acuminatae, strictae, 3–4 cm. longae, oligospermae. *Semina* oblonga, 2·5 mm. longa, glabra, nitida, castanea.

10. **I. Faberi**, *Hk. f.*, sp. nov.

SZECHUAN OCCIDENT. Wa-shan, alt. 1500–2100 m., *E. H. Wilson* in Herb. Arnold Arboret., no. 3063, et Kew.

Primum in Mt. Omi ab *Abbate Faber*, alt. 1350 m. detecta, ex *Aug. Henry*, no. 867, postea ab *E. H. Wilson*, no. 4734.

Herba elata, ramosa, fere glaberrima, mediocriflora, caule ramisque foliosis gracilibus. *Folia* 0·5–1·5 dm. longa, alterna, sessilia vel breviter petiolata, sat firma, elliptica, oblonga vel lanceolata, acuminata, serrata, serrulata vel crenato-serrata, basi acuminata, raro in petiolum 2–4 cm. longum angustata, nervis utrinque 5–8; glandulae infrapetiolares 0. *Inflorescentia* pedunculata; pedunculi 5–10 cm. longi, graciles, erecti, glabri vel puberuli, 2–6-flori; pedicelli florentes 1–3 cm. longi, fructiferi paullo longiores: bracteae 2–3 mm. longae, lanceolatae, deciduae. *Flores* 3 cm. longi, ad 2 cm. expansi, roseo-purpurei; raphides 0. *Sepala* 2, ovata, acuminata, 6–8 cm. longa, 3-5-nervia, viridia, costa crassa. *Vexillum* orbiculare, 1·3–1·7 cm. latum, basi profunde bilobum, apice emarginatum vel bilobum, muticum, costa dorso crasse alata nunc medio tantum gibba vel cornuta. *Alae* sessiles, 2–2·5 cm. longae; lobus basalis rotundatus, distalis major, dolabriformis; auricula dorsalis in filum gracile calcare labelli inclusum producta. *Labellum* corniforme, 3–4 cm. longum, ab ore ascendente dilatato rotundato

apiculato sensim attenuatum, a medio incurvum vel rectum. *Filamenta* brevissima, lata; antherae subacutae. *Ovarium* fusiforme, rectum, acutum, pentagonum. *Capsulae* 2·5–3 cm. longae, anguste lineares, erectae, strictae, acuminatae, oligospermae. *Semina* oblonga, 4 mm. longa, laevia, castanea.

Two species may be included in the above description. In Faber's specimens the leaves are much the largest, the peduncles 2-flowered, the basal lobe of the wings large, and the lip incurved; in Wilson's from Wa-shan, the peduncles are 2–6-flowered, the basal lobe of the wing very small, the distal broad, and the lip straight.

XXXIX.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii, Conservatarum.

DECAS LVIII.

571. **Alsodeia (Pentaloba) Murtonii**, *Craib* [Violaceae-Alsodeieae]; affinis *A. echinocarpae*, Korth., sed foliis supra glabris subtus haud pubescentibus serrulatis, floribus minoribus, petalis hastatis differt.

Ramuli teretes, juventute strigillosi, mox glabri, cortice cinereo obtecti. *Folia* alterna, oblanceolata, acute acuminata vel caudato-acuminata, basi cuneata, 10–15 cm. longa, 3–4 cm. lata, remote serrulata, membranacea, utrinque glabra nisi nervis subtus parcissime setulosa, nervis lateralibus utrinque circiter 12 obliquis intra marginem arcuatis supra conspicuis subtus cum nervis transversis prominentibus; petioli circiter 7 mm. longi; stipulae rigidae, lineari-lanceolatae, circiter 5 mm. longae, deciduae. *Cymae* axillares, sessiles, apices ramulorum versus confertae, compactae, petiolis subaequales. *Sepala* late ovata, obtusa, 2 exteriora maxima 3 mm. longa, 2·5 mm. lata, utrinque extus densius pubescentia, ciliata. *Petala* hastata, sub anthesin apice recurvo, 3·5 mm. longa, 1·5 mm. lata, ungui fere 1·5 mm. longo extus medio intus apicem versus pubescentia. *Discus* ovario aequialtus, glaber, margine crenato stamina gerens. *Filamenta* longiuscula, connectivo in appendicem obtriangularem margine subintegro producto. *Ovarium* vix 1 mm. altum, pilosum, circiter 6-ovulatum; stylus cylindricus, stamina paulo superans, parce pilosus.

Indo-China. Siam: Koh Klone, *Murton*, 15.

This is *A. macrophylla*, Williams, Bull. Herb. Boiss. V. (1905) p. 24 e.p.; H. de Boissieu, Fl. Gen. Indo-Chine, I. 3. p. 217 e.p.; non Decne. The other specimen quoted by Williams and de Boissieu ll. cc. under *A. macrophylla*, viz. *Murton*, 72, belongs to the section *Prosthesia* and comes very near to *A. membranacea*, King, a native of Perak. It is possible that *Murton*, 72, may be the *A. membranacea* of Fl. Gen. Indo-Chine.

572. **Hibiscus glanduliferus**, *Craib* [Malvaceae-Hibisceae]; affinis *H. tiliaceo*, Linn., sed foliis duplo-dentatis, supra hispidis, petiolis glandis majusculis apice ornatis differt.

Caules e radice perenni, annui, circiter 1·2 m. alti (*ex Kerr*), teretes, tomentelli. *Folia* orbicularia vel juniora ovato-lanceolata, apice acuminata, basi cordata nisi juniora rotundata vel cuneata, ad

15 cm. longa, 13·5 cm. lata, duplo-dentata, firme chartacea, supra hispida, subtus laxe tomentosa, nervis primariis e basi circiter 7, secundariis e costa ortis, utrinque plerumque 3, omnibus cum venis transversis supra conspicuis subtus prominentibus ; petioli ad 10 cm. longi, 3 mm. diametro, tomentelli, supra canaliculati, subtus apice glandula instructi ; stipulae lanceolatae vel ovatae, deciduae, 1–1·3 cm. longae, 2·5–9 mm. latae. *Flores* solitarii, axillares, ramulorum apices versus conferti ; pedicelli vix 1 cm. longi, crassi. *Bracteolae* 10, connatae ; tubus 4–6 mm. longus ; lobi subaequales, lanceolatae, apice interdum bifidi, ad 11 mm. longi et fere 5 mm. lati. *Calycis* tubus 1 cm. longus, apice 2 cm. diametro ; lobi 5, ovato-lanceolati, acuti, 1·5–2·8 cm. longi, basi 1 cm. lati ; bracteolarum calycisque indumentum ut in caule. *Petala* 5, obovata, apice truncata, usque ad 6 cm. longa, 4·5 cm. lata, utrinque parce pubescentia, nervis distinctis, sulphurea nisi basi brunnea (*ex Kerr*). *Stamina* ∞, in columnam glabram vix e basi antheriferam circiter 2 cm. longam connata. *Ovarium* densissime pilosum ; styli rami dense papillosi, subconnati. *Fructus* globosus, apiculatus, circiter 2 cm. diametro, dense flavo-hirsutus.

Indo-China. Siam : Chiengmai, in Eng jungle on Doi Sootep, 300–600 m., *Kerr*, 778.

573. **Uraria Lacei**, *Craib* [Leguminosae-Hedysareae] ; affinis *U. paniculatae*, Clarke, sed multo robustior, bracteisque majoribus valde imbricatis distincta.

Fruticulus circiter 1·5 m. altus. *Caules* ferrugineo-tomentosi, teretes, plus minusve sulcati, ad 6 mm. diametro. *Folia* pinnatim trifoliolata ; foliola ovato-lanceolata, apice obtusa, mucronata, basi rotundata, lateralia obliqua, 10 cm. longa, 4–5 cm. lata, terminalia a lateralibus 1·3–2 cm. distantia, 12 cm. longa, 6 cm. lata, margine crenata, chartacea, supra pilis basi incrassatis hispidula, subtus pilosa, nervis lateralibus utrinque circiter 13 ad marginem excurrentibus supra conspicuis subtus prominentibus ; petioli 2–3·5 cm. longi, tomentosi, supra canaliculati, basi incrassati ; stipulae e basi 4 mm. lata subulato-filiformes, circiter 1 cm. longae, striatae ; petioluli 3–4 mm. longi ; stipellae 4 mm. longae, circiter 0·5 mm. latae. *Panicula* terminalis, 42 cm. longa, 20 cm. lata ; rachis ramulique divergentes ferrugineo-tomentosi, et praeterea, praesertim juventute, albo-villosi. *Bracteae* dense imbricatae, ante anthesin caducae, ovato-acuminatae, 7 mm. longae, 5 mm. latae, utrinque extus densius sericeo-pubescentes. *Pedicelli* graciles, circiter 7 mm. longi. *Calyx* circiter 4 mm. longus, lobis lanceolatis acutis tubo subaequilongis, 2 supremis brevioribus pilis basi tuberculatis parce instructis. *Vexillum* 6·5 mm. longum ; alae carina paulo breviores ; carina 8 mm. longa. *Stamina pistillumque* generis. *Legumen* immaturum articulis 6, fere glabrum.

Indo-China. Burma : Maymyo Plateau, 1050 m., *Lace*, 4325 ; Manipur : Laimatak, 900–1200 m., *Meebold*, 6245.

China. Yunnan : Puerh, 1350 m., *Henry*, 9144c.

574. **Pueraria alopecuroides**, *Craib* [Leguminosae-Phaseoleae] ; ab omnibus speciebus adhuc descriptis inflorescentia alopecuroidi facile distinguenda.

Suffrutex scandens ; ramuli ferrugineo-hirsuti, ad 6 mm. diametro. *Folia* pinnatim trifoliolata ; foliola late ovata, caudato-acuminata, mucronata vel juniora sensim ad apicem acutum attenuata, basi rotundata, lateralia obliqua, 8·5–15 cm. longa, 5–10 cm. lata, foliolum terminale a lateralibus 3–6·5 cm. distans, 10·5–15 cm. longum, 6·5–12 cm. latum, margine crenata, membranacea, supra parce pilosa, subtus juventute appresse pilosa, nervis lateralibus utrinque 6–8 ad marginem excurrentibus supra conspicuis subtus cum nervulis prominentibus ; petioli 10–20 cm. longi, parce ferrugineo-hirsuti, supra canaliculati ; stipulae medio affixae, sagittatae, 2·2 cm. longae, 8 mm. latae, striatae ; petioluli 0·5–1 cm. longi ; stipellae lineari-lanceolatae petiolulos paulo superantes, striatae. *Inflorescentia* racemoso-paniculata, axillaris, ante anthesin densissima, alopecuroides, ut visa 22 cm. longa ; ramuli 10 cm. longi, basi bractea stipulis simillima instructi ; bracteae lanceolatae vel lineari-lanceolatae, acutae, circiter 1·3 cm. longae, alabastra superantes, pilis longis rigidulis ferrugineis instructae ; pedicelli 5 mm. longi, bracteolis 2 circiter 5·5 mm. longis. *Calyx* campanulatus, puberulus et praeterea pilis ferrugineis longis instructus ; tubus 3 mm. longus ; lobi lanceolati, acuti, 2 superiores connati, 5 mm. longi, laterales fere 4 mm. longi, lobus inferior 6 mm. longus. *Vexillum* suborbiculatum, emarginatum, fere 1 cm. longum et latum, basi auriculis inflexis appendiculatum, ungue 2·5 mm. longo. *Alae* oblongae, longe appendiculatae, carinam paulo superantes. *Carina* 1 cm. longa, obtusa. *Stamina* medio connata, vexillare ima basi liberum ; antherae uniformes. *Ovarium* sessile, 7 mm. altum, parcissime pilosum, circiter 6-ovulatum ; stylus superne inflexus, stigmate parvo terminali brevissime penicellato.

Indo-China. Upper Burma : Shan Hills, Gokteik, 600 m., *Meebold*, 8058.

China. Southern Yunnan : Szemao, *Bons d'Arty*, 255.

575. **Dunbaria longeracemosa**, *Craib* [Leguminosae-Phaseoleae] ; affinis *D. bellae*, Prain, sed racemis multo longioribus et foliolis majoribus apice obtusis vel subacutis differt.

Frutex scandens ; ramuli puberuli, teretes, striati, cortice pallide rubro-brunneo. *Folia* pinnatim trifoliolata, ad 18 cm. longa ; foliola oblique oblonga vel oblongo-elliptica, apice obtusa vel subacuta, basi rotundata vel cuneata, 5–13·5 cm. longa, 1·5–5 cm. lata, margine integro leviter recurvo, chartacea, supra pilis brevibus scabridula, subtus pilosa et glandulis parvis rubris ornata, trinervata, nervis secundariis (e costa ortis) utrinque circiter 5, nervis omnibus cum nervulis supra conspicuis subtus prominentibus ; rhachis communis usque ad 8 cm. longa, supra canaliculata ; petioluli 2–3 mm. longi ; stipulae deciduae ; stipellae minutissimae vel deficientes. *Racemi* breviter pedunculati usque ad 5·8 dm. longi, laxi ; pedicelli plerumque geminati, circiter 5 mm. longi, bracteis deciduis. *Calyx* puberulus, gibbosus, tubo 5 mm. longo, 4 mm. diametro ; lobi 4, tubo breviores, infimo lanceolato longissimo, ciliati. *Corolla* longe exserta ; vexillum rubro-brunneum, suborbiculatum, 1·3 cm. longum, 1·5 cm. latum, ungui 3·5 mm. longo, basi appendiculatum ; alae oblique oblongo-obovatae, 1·2 cm. longae, carinae medio adhaerentes ; carina sulphurea, incurva, apice obtusa alis subaequialta. *Stamen*

vexillare omnino liberum ; antherae uniformes. *Ovarium* sessile, 7 mm. altum, densissime glandulosum, pluri-ovulatum ; stylus circiter 1·5 cm. longus, superne glaber, apice dilatato. *Legumen* (vix maturum) lineare, rectum, 7 cm. longum, 8 mm. latum, velutinum et glandulosum.

INDO-CHINA. Siam ; Chiengmai, in deciduous jungle on Doi Sootep, 300–900 m., *Kerr*, 917 ; Kan Phra Dang, *Hosseus*, 148.

576. **Oldenlandia Prainiana**, *Craib* [Rubiaceae-Hedyotideae] ; inter species indicas adhuc descriptas habitu et inflorescentia facile distinguenda.

Herba diffuse ramosa, flaccida, laxe pilosa. *Folia* ovata vel ovato-lanceolata, apice obtusa vel subacuta, basi cuneata, 4–7 mm. longa, 2–4·5 mm. lata ; petioli 1–3 mm. longi ; stipulae minutissimae, subulatae. *Flores* solitarii, axillares vel terminales, albi vel roseo-albi. *Receptaculum* 1 mm. longum. *Calycis* lobi 4–5, lanceolati, acuti, interdum inaequales, receptaculo aequilongi. *Corollae* tubus gracilis, 7 mm. longus, 0·5 mm. diametro, extra glaber, fauce pilosa ; lobi ovati, subacuti, 2 mm. longi. *Stamina* 4, fauci inserta ; filamenta brevia, glabra ; antherae exsertae, oblongae, 1·5 mm. longae. *Stylus* filiformis, stigmatis ramis 2 brevibus. *Fructus* didymus, pilosus, loculicide dehiscens ; semina nigra, minuta, angulata, foveolata.—*Anotis Prainiana*, Talbot mss. in Herb. Kew.

INDIA. Mysore : Bababudan Hills; Santaveri, 1500 m., *Talbot*, 2995 ; Kulhutty, *Meebold*, 4887.

577. **Hoya fuscomarginata**, *N. E. Brown* [Asclepiadaceae-Marsdenieae] ; affinis *H. Pottsii*, Traill, sed foliis multo majoribus acutis vel gradatim subacuminatis nec abrupte acuminatis, petiolis crassioribus, corolla ochracea vel flavo-virente et coronae lobis purpureo-tinctis facile distinguitur.

Folia crasse carnosa ; lamina 17–22 cm. longa, 7–8 cm. lata, ovato-lanceolata, interdum leviter obliqua, acuta vel gradatim subacuminata, obtusa vel subcuneata, 3–5-nervia, glabra, viridia, marginibus fuscis ; petiolus 2·5–4·5 cm. longus, 7 mm. crassus, cinereus. *Umbelli* multiflori. *Pedunculi* 3·5–4·5 cm. longi, 2·5 mm. crassi. *Pedicelli* graciles, 2 cm. longi. *Sepala* minuta, 1 mm. longa, ovata, acuta, ut pedicelli et pedunculi parce et minutissime puberula. *Corolla* rotata, 1·2–1·3 cm. diametro, glabra, ochracea vel flavo-virens, lobis 5 mm. longis et latis late ovatis abrupte breviter acuminatis patentibus apice recurvis. *Coronae* lobi 3·5 mm. longi, stellato-patentes, ovati, utrinque acuti, leviter purpureo-tincti.

Origin unknown. It was purchased in Brussels by Mr. F. W. Moore of the Royal Botanic Gardens, Glasnevin, from Mr. Pauwels, who stated that it had been imported with Orchids from British Guiana. But it can scarcely be a native of that country, as no species of *Hoya* is known to inhabit America.

578. **Strobilanthes (Acanthopale) Meeboldii**, *Craib* [Acanthaceae-Ruellieae]; ex affinitate *S. ixiocephali*, Benth., sed spicis bracteisque multo minoribus haud glanduloso-pubescentibus differt.

Fruticulus haud gregarius, circiter 1 m. altus ; ramuli teretes, glabri, nodis incrassatis. *Folia* ovata vel ovato-lanceolata, longe acuminata, apice obtusa, basi inaequalia, cuneata, petiolo paullo decurrentia, 5·5–13·5 cm. longa, 2·5–5 cm. lata, crenato-serrata,

chartacea, margine ciliato excepto glabra, superne lineolata, nervis lateralibus utrinque 5–7 obliquis supra conspicuis subtus prominentibus, nervulis supra vix conspicuis subtus prominulis; foliorum oppositorum petioli valde inaequales, 1–5 cm. longi, fere glabri, supra canaliculati, basi incrassati. *Spicae* racemis axillaribus dispositae, ad 1·5 cm. longae, circiter 7·5 mm. diametro. *Bracteae* sub anthesin persistentes, late ovatae vel ovato-lanceolatae, apice obtusae vel breviter obtuse acuminatae, ad 5 mm. longae, 3 mm. latae; bracteolae 2, lineares fere 5 mm. longae ut bracteae ciliatae. *Calyx* 5-partitus, segmentis lanceolatis apice subacutis 6·5 mm. longis 1·5 mm. latis ciliatis et nigro-punctatis. *Corolla* longe exserta, campanulato-infundibuliformis, parte basi cylindracea parti ventricosae subaequali, circiter 1·2 cm. longa, extus glabra, intus pilosa. *Stamina* 4, didynama, longe exserta, 0·7–1·2 cm. longa. *Ovarium* glabrum; stylus stamina longiora aequans. *Fructus* ignotus.

India. Mysore: Kempkull, 300 m., *Meebold*, 10,783.

According to a note in Herb. Calc. by Mr. Meebold this is also the same as Talbot's 1338 from North Kanara.

579. **Machilus phoenicis**, *Dunn* [Lauraceae-Perseaceae]; affinis *M. microcarpae*, Hemsl., sed floribus multo majoribus.

Arbor mediocris cortice brunneo. *Folia* sparsa, ovato-lanceolata, integra, 10–13 cm. longa, crasse coriacea, glabra, subtus glauca, acuminata, basi cuneata vel rotundata, venis utrinque 8–10, obscure reticulata, petiolis 1·3–1·9 cm. longis. *Flores* paniculas plures 5–8 cm. longas ex gemma terminali magna evolutas formantes; perulae exteriores utrinque glabrae, interiores utrinque sericeae. *Perianthii* ♂ segmenta subaequalia, oblonga, 6–8 mm. longa, apice intus brevissime sericea, viridia, obtusa. *Stamina* 4-locellata, exteriora introrsa, interiora extrorsa. *Flores* ♀ et *fructus* non visi.

China. Eastern Kwantung: near Swatow, bushy gorges on the sides of Phoenix Mountain at 1300 m., *Dunn's native collector*, Hong Kong Herb. 5803.

580. **Phyllanthodendron album**, *Craib et Hutchinson* [Euphorbiaceae-Phyllantheae]; affine *P. rosei*, Craib et Hutchinson, sed foliis lanceolatis, stipulis basi haud productis valde distinctum.

Arbuscula 4·5–7·5 m. alta (*fide Kerr*). *Ramuli* subteretes, glabrescentes, juveniles flexuosi. *Folia* alterna, lanceolata, apice subacuminata, basi inaequalia, rotundata, 8–18 cm. longa, 2–4 cm. lata, chartacea, supra fusco- subtus pallide viridia, utrinque glabra, nervis lateralibus utrinque 10–12 gracilibus arcuatis cum costa supra distinctis subtus prominulis, nervis transversis paucis indistinctis; stipulae e basi lata subulatae, 1·5 mm. longae, glabrae; petioli 5–7 mm. longi. *Flores* axillares, fasciculati, ♂ numerosi, ♀ solitarii vel subsolitarii. ♂ *Pedicelli* 2–3 mm. longi, glabri. *Sepala* 5, elliptica vel obovato-elliptica, obtusa, 2·5 mm. longa, 1·5 mm. lata, 1-nervia, dorso carinata, utrinque glabra. *Disci* glandulae oblongae, truncatae, quam sepalis dimidio breviores. *Stamina* 3; filamenta brevia, connata; antherae inter se liberae, 0·75 mm. longae, connectivo in appendicem lineari-subulatam 0·25 mm. longam producto. ♀ *Pedicelli* quam ♂ breviores. *Sepala* 6, oblongo-elliptica, cetera ut in ♂. *Discus* 6-partitus, segmentis oblongis truncatis quam sepalis paulo brevioribus. *Ovarium* globosum,

leviter trilobatum, glabrum; styli brevissimi, stellato-patuli, apice minute bifidi. *Capsula* late ovoidea, alba (*fide Kerr*), 1·5–2 cm. longa, circiter 1·3 cm. diametro, exocarpio membranaceo reticulato, endocarpio corneo 0·5 mm. lato pallide flavo; semina irregulariter subtriquetra, dorso convexa, in utroque latere excavatione alternatim supra et infra auriformi, 1 cm. longa, dorso 4 mm. lata; testa nitida, minutissime et oblique striolata.

Indo-China. Siam: Chiengmai, on old clearings on Doi Sootep, 720–810 m., *Kerr*, 521, 566.

XL.—NEW ORCHIDS: DECADE 36.

351. **Bulbophyllum trifarium**, *Rolfe*; inter species Madagascarienses parvifloras bracteis et floribus trifariis distincta.

Rhizoma repens, subgracile. *Pseudobulbi* ovoideo-oblongi, 1–5 cm. longi, vaginis membranaceis vestiti, monophylli. *Folia* sessilia, elliptico-oblonga, obtusa, obscure bidentata, coriacea, circiter 4 cm. longa, 1·5 cm. lata. *Scapi* arcuati, 13–15 cm. longi, vaginis membranaceis obtecti; spicae 7–9 cm. longae, multiflorae, rhachi crebre et dense verrucosa. *Bracteae* trifariae, patentes, triangulari-ovatae, breviter acuminatae, 2–3 mm. longae. *Pedicelli* 2 mm. longi. *Sepala* subconniventia, 6–7 mm. longa, posticum ovata-lanceolatum, acuminatum, concavum; lateralia oblique lanceolata, acuminata, subconcava. *Petala* subulato-lanceolata, acuminata, 3 mm. longa. *Labellum* recurvum, oblongum, obtusum, carnosum, lateribus longe barbatis. *Columna* lata, 1 mm. longa; dentibus arcuatis subulatis.

Madagascar.

Flowered in the collection of Sir Trevor Lawrence, Bart., Burford, Dorking, in May, 1897, and on subsequent occasions. The flowers are dull lurid purple, with numerous minute darker dots on the sepals.

352. **Eulophia circinnata**, *Rolfe*; affinis *E. caffrae*, Reichb. f., scapis gracilioribus floribus minoribus et labello latiore differt.

Pseudobulbi ovoideo-oblongi vel fusiformes, apice 2–3-phylli. *Folia* lineari-oblonga, acuta, carnosa, rigida, paullo serrulata, 15–20 cm. longa. *Scapi* laterales, erecti, 6–9 dm. longi, parce ramosi. *Bracteae* subulato-lanceolatae, acuminatae, 6 mm. longae. *Pedicelli* 2·5–3 cm. longi. *Flores* numerosi, laxi. *Sepala* patentia anguste lineari-oblonga, acuta, apice valde revoluta vel circinnata, 2 cm. longa. *Petala* erecta, sepalis paullo breviora et latiora, apice paullo revoluta. *Labellum* late panduratum vel 3-lobum, 2 cm. longum; lobi laterales angusti, venis furcatis instructi; lobus intermedius suborbicularis, undulatus, radiato-venosus; discus carinis 5 crenulatis instructus, mediis 3 longioribus et elevatis; calcar subclavatum, valde curvatum, 6 mm. longum. *Columna* clavata, 6–8 mm. longa; anthera bicornis. *Capsula* ellipsoidea, circiter 4 cm. longa.

S. Africa. Transvaal: at Komati Poort, *J. W. C. Kirk*, 64.

353. **Eulophia longipes**, *Rolfe*; affinis *E. aemulae*, Schlechter, labelli lobis lateralibus duplo latioribus et calcare longiore differt.

Rhizoma validum; nodi incrassati. *Folia* 4–5, fasciculata, linearia, acuta (immatura), basi vaginis latis 4–5 obtecta. *Scapi* circiter 45 cm. longi, basi vaginis 2–3 lanceolatis obtecti; racemi laxi,

15 cm. longi. *Bracteae* ovato-lanceolatae, acutae, venosae, 0·6–1·2 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* parvuli. *Sepala* late lanceolata, acuta, 1·2 cm. longa. *Petala* sepalis similia basi paullo latiora. *Labellum* 3-lobum, petalis paullo brevius ; lobi laterales lati, oblongi, subobtusi ; lobus intermedius late ellipticus, obtusus ; discus carinis 7 incrassatis valide papillosis instructus, mediis 3 fere ad basin extensis ; calcar clavatum, gracile, 4 mm. longum. *Columna* clavata, 4 mm. longa, basi in pedem brevem extensa.

S. Africa. Natal, *Buchanan*, 3.

354. **Eulophia purpurascens**, *Rolfe* ; ab *E. barbata*, Spreng., racemis elongatis et laxioribus, labello duplo angustioribus differt.

Rhizoma validum ; nodi incrassati. *Folia* 3–4, fasciculata, stricta, suberecta, anguste elongato-linearia, subacuta, venosa, 15–30 cm. longa, basi vaginis 2–3 lanceolatis obtecta. *Scapi* laterales, erecti, stricti, 0·4–0·8 m. longi, basi vaginis angustis imbricatis obtecti ; racemi elongati, 8–18 cm. longi, multiflori. *Bracteae* lanceolatae, acuminatae, 0·6–1·2 cm. longae, saepissime suberectae. *Pedicelli* graciles, 0·8–1·2 cm. longi. *Flores* mediocres. *Sepala* subconniventia, lanceolata vel anguste oblongo-lanceolata, acuta, 1·2–2 cm. longa, purpureo-brunnea. *Petala* elliptico-lanceolata, subacuta, sepalis subaequalia, purpurea, carnea vel alba et purpureo-maculata. *Labellum* profunde 3-lobum, petalis subaequale ; lobi laterales late oblongi ; lobus intermedius obovatus, apice obtusus vel rotundatus, copiose ramentaceus ; discus basi carinis 3 verrucosis instructus ; calcar clavatum, gracile, rectum vel leviter curvatum, 4–6 mm. longum. *Columna* clavata, 6 mm. longa, apoda.

S. Africa. Natal : Tongaat River, 155 m., *Wood in Mac-Owan & Bolus Herb. Norm. Austr.-Afr.*, 1367, and other localities.

355. **Eulophia gladioloides**, *Rolfe* ; a praecedente labelli lobis lateralibus brevibus multo latioribus differt.

Folia 2–3, fasciculata, stricta, erecta, anguste elongato-linearia, acuta vel attenuata, 30–45 cm. longa, basi vaginis 2–3 lanceolatis imbricatis obtecta. *Scapus* erectus, circiter 60 cm. longus, basi vaginis angustis imbricatis obtectus ; racemus circiter 15 cm. longus, multiflorus. *Bracteae* lanceolatae, acuminatissimae, 1–2 cm. longae. *Pedicelli* graciles, 2 cm. longi. *Flores* lilacini. *Sepala* lineari-lanceolata, apiculata vel acuta, 1·2–1·4 cm. longa. *Petala* oblonga vel elliptico-oblonga, subobtusa, sepalis paullo breviora. *Labellum* 3-lobum, petalis subaequale ; lobi laterales breves, apice rotundati ; lobus intermedius suborbicularis, obtusus ; discus medio venis valide cristatis, basi carinis 3 verrucosis instructus ; calcar clavatum, gracile, apice curvatum, 4 mm. longum. *Columna* clavata, 8 mm. longa, apoda.

S. Africa. Natal : at Lidgetton, 915–1250 m., *Wood*, 7922.

356. **Eulophia ovatipetala**, *Rolfe* ; ab *E. barbata*, Spreng., racemis elongatis laxioribus et labelli venis 5–7 cristatis differt.

Folia non vidi. *Scapi* 25–38 cm. longi, vaginis angustis numerosis obtecti ; racemi 8–20 cm. longi, laxi, multiflori. *Bracteae* ovato-lanceolatae vel elliptico-lanceolatae, acuminatae, 0·8–1·5 cm. longae. *Pedicelli* graciles, 1·2 cm. longi. *Flores* patentes, interdum nutantes, mediocres. *Sepala* oblonga vel lanceolato-oblonga, acuta, 1·2–1·4 cm. longa, submembranacea. *Petala* ovata, obtusa, sepalis paullo longiora

et duplo latiora. *Labellum* late ovato-ellipticum, apice obtusum vel rotundatum, petalis paullo brevius ; lobi laterales late rotundati ; lobus intermedius late rotundatus ; discus carinis 5–7 gracilibus cristatis instructus, carinis basi verrucosis ; calcar apice gracile et paullo incurvum, basi latius. *Columna* oblonga vel subclavata, 5–6 mm. longa, basi in pedem brevem extensa.

S. Africa. Port Elizabeth Div. : at Emerald Hill, *Bolus*, 10,674.

357. **Eulophia Engleri**, *Rolfe* ; inter affines labello suborbiculari et dense papilloso facile distinguitur.

Rhizoma validum ; nodi incrassati. *Folia* (immatura). *Scapi* laterales, erecti, circiter 30 cm. longi, basi vaginis lanceolatis obtecti ; racemi laxi, circiter 9-flori. *Bracteae* ovatae vel ovato-lanceolatae, acuminatae, 0·8-1·2 cm. longae. *Pedicelli* graciles, circiter 1·2 cm. longi. *Sepala* oblonga vel elliptico-oblonga, obtusa, 1·2 cm. longa. *Petala* late elliptica, sepalis aequalia. *Labellum* profunde 3-lobum, petalis paullo brevius ; lobi laterales late rotundati ; lobus intermedius late orbicularis ; discus copiose papillosus, basi carinis 5 verrucosis instructus ; calcar clavatum, 4 mm. longum. *Columna* clavata, 5 mm. longa.

S. Africa. Transvaal ; among stones at Klip River Mountains, 1830 m., *Engler*, 2745.

358. **Eulophia transvaalensis**, *Rolfe* ; ab *E. Engleri*, Rolfe, labelli disco parce papilloso differt.

Folia non vidi. *Scapus* erectus, vaginis lanceolatis acutis obtectus; racemus 10 cm. longus, laxus, circiter 6-florus. *Bracteae* elliptico-ovatae, acutae vel breviter acuminatae, patentes, 6–8 mm. longae. *Pedicelli* graciles, 8 mm. longi. *Sepala* late oblonga, subacuta, circiter 1 cm. longa. *Petala* ovato-oblonga, subobtusa, sepalis paullo latiora. *Labellum* late ovatum, 3-lobum, sepalis subaequale ; lobis lateralibus late rotundatis ; lobus intermedius fere quadratus, apiculatus ; discus carinis 5–7 papillosis instructus, basi carinis 3 verrucosis extensis ; calcar clavatum, strictum, 4 mm. longum. *Columna* late oblonga, 5 mm. longa, basi in pedem brevem extensa.

S. Africa. Transvaal : Vaal Bank ; between the Devil's Kantoor and Pretoria, 1525–1830 m., *Bolus*, 10,676.

359. **Polystachya Talbotii**, *Rolfe* ; *P. Preussii*, Kränzl., similis, sed ab ea labello ecalloso differt.

Herba epiphytica, 8–12 cm. alta. *Pseudobulbi* approximati, basi ovoidei vel ovoideo-oblongi, apice angusti, 1–3 cm. longi, 2–3-phylli. *Folia* sessilia, lineari-oblonga, apice minute tridentata, 4–7 cm. longa, 6–9 mm. lata. *Scapi* pubescentes, 4–8 cm. longi ; racemi 4–6-flori. *Bracteae* deltoideae, acuminatae, 2 mm. longae. *Pedicelli* 4 mm. longi. *Flores* albi, labello rufo-brunneo, columna purpurea. *Sepalum* posticum suborbiculari-ellipticum, concavum, apiculatum, 6 mm. longum ; sepala lateralia elliptico-ovata, apiculata, subfalcata, 6–8 mm. longa. *Petala* elliptico-oblonga, sub-obtusa, 6 mm. longa. *Labellum* unguiculatum, 3-lobum ; limbus 6 mm. longus ; unguis 3 mm. longus ; lobi laterales lati, obtusi ; lobus intermedius obovatus, obtusus, leviter canaliculatus. *Columna* lata, 4 mm. longa. *Mentum* oblongum, obtusum, 6 mm. longum.

Tropical Africa. Upper Guinea : S. Nigeria ; Oban District at Niaji, *Talbot*, 835.

360. **Cynorchis Morlandii**, *Rolfe ;* affinis *C. fastigiatae*, Lindl., sed planta monophylla, folio late elliptico-ovato et labelli lobis longioribus distincta.

Herba terrestris, monophylla. *Folia* sessilia, patentia, late elliptico-ovata, apiculata vel breviter et abrupte acuminata, nitida, 6–12 cm. longa, 4–7 cm. lata. *Scapi* erecti, nitidi, 20–30 cm. alti, infra medium vagina angusta obtecti ; racemi breves, subcorymbosi, 5–9-flori. *Bracteae* oblongo-lanceolatae, acuminatae, 1–1·8 cm. longae. *Pedicelli* 2·5-3 cm. longi. *Flores* mediocres, lilacini. *Sepalum* posticum erectum, subobtusum, concavum, 5 mm. longum ; sepala lateralia subpatentia, late oblonga, subobtusa, paullo concava, 5–6 mm. longa. *Petala* ovato-oblonga, subobtusa, 5 mm. longa, cum sepalum posticum in galeam conniventia. *Labellum* subpatens, 1–1·5 cm. longum, 4-lobum ; lobi ovato-oblongi, obtusi, denticulati, 5–7 mm. longi ; discus laevis ; calcar filiforme, incurvum, circiter 2·5 cm. longum. *Columna* 3 mm. longa.

Tropical Africa. Mozamb. Dist. : Island of Pemba, *C. E. Morland.*

Flowered at Kew in May, 1910, the tubers having been presented by Mr. C. E. Morland, who brought them from the Island of Pemba in the previous autumn. The flowers are lilac-coloured, becoming greenish white on the disc of the lip and at the base of the other segments.

XLI.—INDIGO.

J. H. Holland.

In the *Kew Report* for 1880 some details of Synthetic Indigo were given, and the displacement by it of Natural Indigo was predicted. Eighteen years later (*Kew Bull.* 1898, p. 33), it was pointed out that this prediction, though not quite fulfilled, was approaching realization. At the present time (1910) there is no doubt that the discovery of Artificial Indigo, although a triumph for the chemist, is a misfortune for the planter, and it is now generally conceded that the trade in the Natural Indigo, in all parts of the world, has declined by reason of the advance made by the artificial product during the past 9 or 10 years, although local conditions may to some extent have contributed towards the degeneration of the industry. There should also be taken into consideration the fact that the cultivation has always been somewhat of a precarious nature, a good "stand" apparently being more the exception than the rule. This view is borne out by the remarkable fluctuations in the quantities exported, obtained presumably from the same area. Discovered in 1880 by Professor Baeyer, and made commercially available in 1890 by Professor Heumann, Synthetic Indigo was only beginning in 1901 to find its way into commerce in appreciable quantities. About that time the German Naval Administration refused "all woollen cloth dyed with Synthetic or Artificial Indigo," and required "all blue materials to be dyed with Natural Indigo from India," at least until some experiments they were then conducting were completed (Journ. Soc. Arts, xlix. 1901, p. 395). Interest in the artificial product was not wanting, but the attitude of this

important branch of the German Administration towards it is sufficient testimony of the stage at which it then stood.

In 1902 some samples of Artificial Indigo were exhibited at the Royal Society by the Badische Anilin und Soda Fabrik, of Ludwigshafen on the Rhine, and the manufacture was described as follows :—

"The initial material is napthalene ; this is converted by oxidation with sulphuric acid into phtalic-anhydride, and the latter is next transformed into anthranilic acid, which, in conjunction with chloracetic acid, yields phenylglycin-orthocarboxylic acid. The latter body is treated with a caustic alkali at a high temperature, and yields indoxyl or indoxylic acid.

"It is interesting to note that this product indoxyl also results in the treatment of the indigo plant as practised in the tropics.

"The last stage in the process, whether starting from napthalene or from the indigo plant, is identical, viz., the oxidation of indoxyl into indigo" (Descr. Cat. Roy. Soc. Conversaz. May 14th, 1902, p. 4).

Efforts are now being made by the Government of India to improve the situation for the planter. The Agricultural Department is enquiring into the possibilities of improvement in cultivation on scientific principles, especially in the direction of producing a plant with a greater indican content in the leaf than is usually found in that of *Indigofera tinctoria*, and in general with a view to reducing the cost of production as much as possible.

This has, to a large extent, already been met by the cultivation of "Natal" or "Java" Indigo (*Indigofera arrecta*, Hochst.), which is said to yield about twice the amount of green leaf, with a proportionate increase of the dye. The uncertainty of germination, which is characteristic of this species, due to the very hard seed coat or testa, has been almost entirely overcome by scratching the seed before sowing in a specially constructed machine, and the same or possibly a better result is obtained by treatment with sulphuric acid (Agric. Journ. India, i. 1906, p. 262).

The chemistry of Indigo, mainly devoted to analysis of the commercial product and the leaf in estimation of the indican content, is being studied at the University of Leeds, and in the field (Report to the Government of India: an account of the Research Work on Indigo in the University of Leeds, 1905–7, under the direction of Professor Perkin).

Dyeing tests with Natural and Synthetic Indigo carried out at Sirseah, India, so far indicate that the natural dye goes further than the synthetic dye (Burkill & Annett, Industr. and Agric. Chemistry, p. 13).

Cloth dyed entirely with Synthetic Indigo fades in about two months, but a mixture of the artificial and natural product is more durable and also brighter in colour than the Natural Indigo (Journ. Soc. Arts, lii. 1904, p. 539).

Experiments on manufacture at Sirseah, mainly directed to the question of loading the vats, show that "good quality Java plant should never be loaded more heavily than 80 maunds [6,576 lbs.] per 1,000 cubic feet, and the loading should be increased as the quality of the plant falls off (Burkill and Annett, l.c.).

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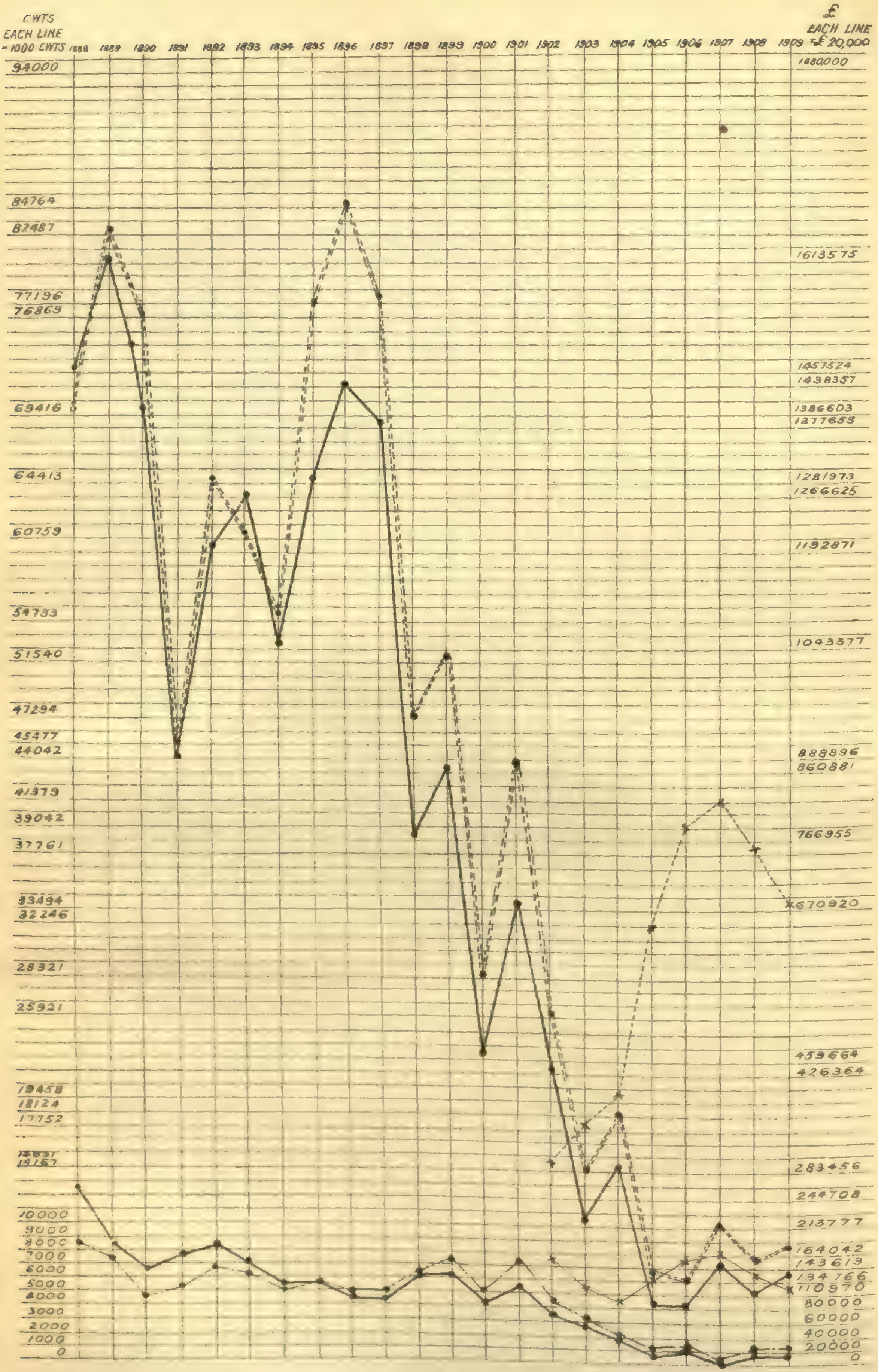

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It is hoped, therefore, that by this working together of the scientific and the practical some method may be evolved, and some definite advance made that will enable the natural product to hold its own.

There appears to be no doubt as to the superiority of the natural over the artificial product for dyeing purposes, and this is not where the fault lies; but it does seem very problematical as to whether good quality indigo can ever be produced under cultivation at so cheap a rate as that at which the synthetic substance is now manufactured. It has been stated that the two products are more effective when mixed in equal proportions, and if this be always true it is possible that it may contribute more than anything else to the support, and perhaps to the expansion, of the cultural industry.

The value for "fine Bengal" Indigo between the years 1812 to 1833 varied from 5*s.* 6*d.* to 15*s.* per lb., and the average quantities exported from Bengal during the same period varied from about 7,000,000 to 9,000,000 lbs. annually (Dict. Commerce and Navigation, McCulloch, 1834, p. 683). It will be noted that in 1888 (*see* the accompanying chart), the average exports from British India (Bengal the chief source), are approximately the same, and we may perhaps correctly assume, allowing for fluctuations stated, that they have been about the same during the intervening period of 50 years or so, although the value in 1888 averaged 3*s.* 9*d.* per lb. and in 1908 about 2*s.* 6*d.* to 2*s.* 9*d.* per lb.

Superior sorts of Java Indigo were in 1901 quoted at from 4*s.* 9*d.* to 5*s.* 1*d.* per lb. (Cons. Rep. Ann. No. 2761, 1902, p. 7).

The price of Synthetic Indigo in 1897 was 30 frs. per kilo., or 10*s.* 10*d.* per lb. (Cons. Rep. Ann. No. 2668, 1901, p. 24); in 1900, 6*s.* 4*d.* per lb. delivered free at consumer's works, the cost to the manufacturer being only 3*s.* 7*d.* per lb. (l.c.); in 1902 the value comes out at 1*s.* 9*d.* per lb., and in 1908 at 7½*d.* per lb. (c.i.f. to place of landing, *see* chart).

According to Mr. Consul-General Gurney, Artificial Indigo was first launched on the French market under the name of "Indigo pure, B.A.S.F." (Badische Anilin und Soda Fabrik), and the pure product is still sold under the same name; but for facility of manipulation it is sold in the form of a paste containing 20 per cent. of indigotine, convenient for transport and use (Cons. Rep. Ann. No. 2668, 1901, p. 22).

In the earlier stages of its commercial development in this country the imports were returned amongst "other coal tar dyes," in 1902 and 1903 as "Indigotin," and afterwards as "Synthetic Indigo."

The accompanying chart gives an approximate idea of the present position of the dual industry. It represents only the imports of the United Kingdom. The figures are taken from "The Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions," compiled at the Custom House. The values include prime cost, plus insurance and freight to place of landing.

The exact figures up to 10,000 cwts. and £100,000 are, for want of space, omitted.

The graph is confined advisedly to the returns given in the above mentioned statement.

The foreign countries include Germany, Netherlands, Belgium, France, Austrian Territories, U.S. America, San Salvador, Colombia, Philippines, and Ecuador, involving probably the produce of three species of *Indigofera*, viz., *Anil*, *arrecta*, and *tinctoria*.

Egypt as a source of Indigo is mentioned once in the returns covered by the chart—17 cwts., value £122 in 1897, and also the French Possessions in India—85 cwts., value £1090.

The British Possessions include Bengal (the chief source), Bombay and Sind, Madras, Straits Settlements, Ceylon and British Honduras, the produce of *Indigofera tinctoria*, and in recent years possibly also of *Indigofera arrecta*. Returns from the Niger Coast Protectorate appear once only—13 cwts., value £19 in 1896, which may have been derived from *Indigofera tinctoria*, but it is possible that it may also have been in part the produce of *Lonchocarpus cyanescens*.

The countries from which Synthetic Indigo comes are Germany (the chief source of supply to this country), France and the Netherlands.

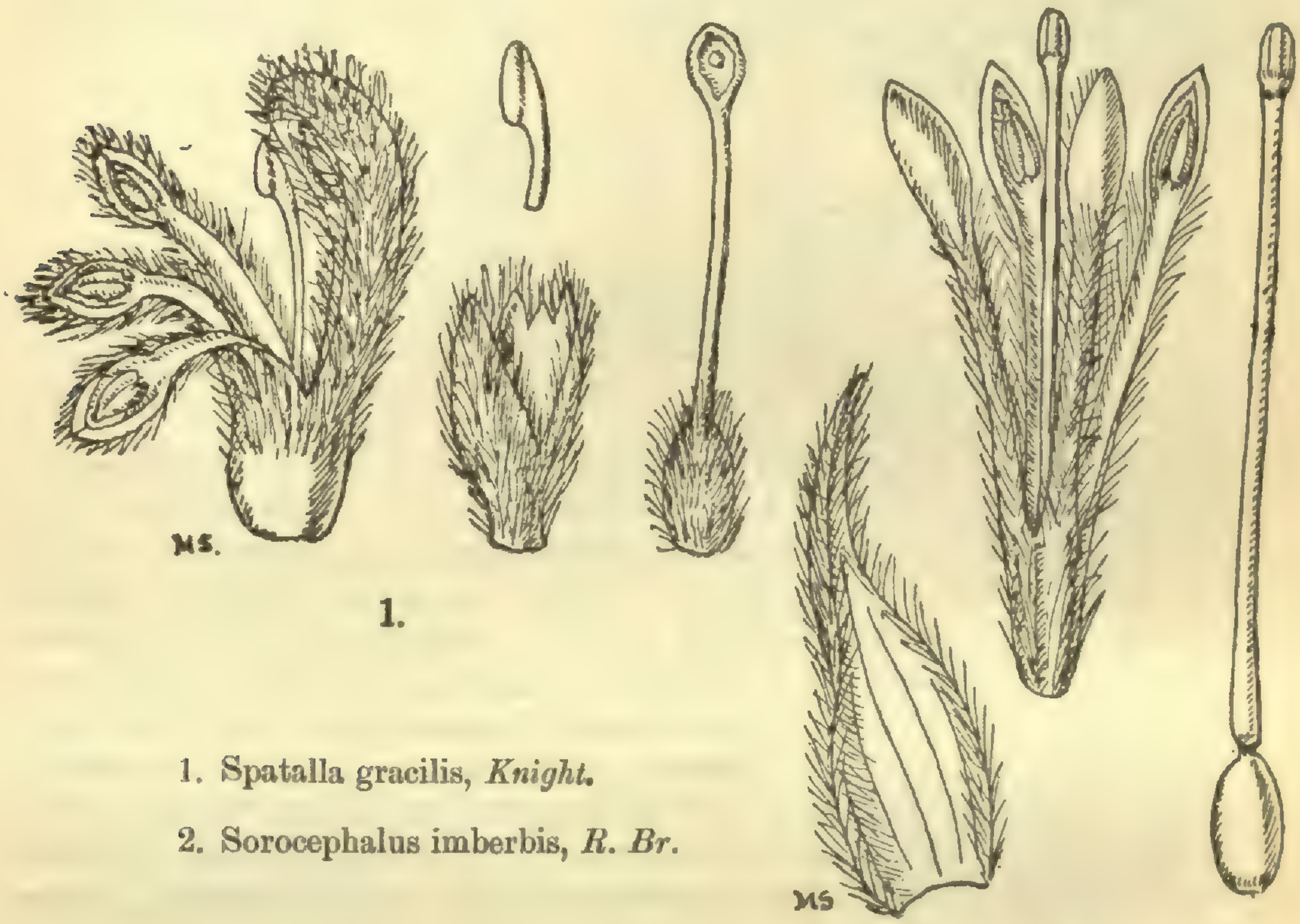
As showing the extent of the trade in Synthetic Indigo between Germany and other parts of the world, in 1905 the exports of Indigo (almost exclusively Synthetic or Artificial) from Germany were (in metric tons) as follows :—To Belgium, 235 ; France, 135 ; United Kingdom, 1561 ; Italy, 467 ; Netherlands, 640 ; Austria-Hungary, 1141 ; Russia, 316 ; Sweden, 81 ; Switzerland, 82 ; Spain, 63 ; Turkey, 25 ; Egypt, 281 ; India, 155 ; China, 2597 ; Japan, 639 ; and to the United States of America, 2536 (Dip. and Cons. Rep. No. 3544, Ann. 1906, p. 66, which see for Exports for the years 1902, 1903, and 1904).

XLII.—SPATALLOPSIS, A NEW GENUS OF PROTEACEAE.

E. P. Phillips.

Knight in his description of the genus *Spatalla*, in his Proteeae (pp. 73–78) included three plants *S. thyrsiflora*, Knight, *S. ericaefolia*, Knight, and *S. caudaeflora*, Knight, which differ from his other species in the genus in having conical stigmas (described as clavate). R. Brown (Trans. Linn. Soc. x. 150) also described three plants under the genus *Spatalla*, namely, *S. propinqua*, R.Br., *S. caudata*, R.Br., and *S. Thunbergii*, R.Br. (= *S. caudaeflora*, Knight), regarding at the same time *Spatalla thyrsiflora*, Knight, as a *Sorocephalus*, and describing it as *S. setaceus*, R.Br. l.c. 140. Later authors, as Roemer and Schultes in their Systema Vegetabilium, iii., 389–396, and Meisner (in DC. Prodr. xiv., pp. 303–310), whose monograph is the last important systematic work on the *Proteaceae*, followed Robert Brown, ignoring Knight. When working through the genus *Spatalla* I found that all the above-mentioned species not only differed from the true Spatallas in having a conical and not a flat obovate stigma but also that the calyx was regular, whereas in *Spatalla* the inner

calyx-segment is always larger, more densely villous and longer-bearded than the other three. On account of their having a regular calyx and a conical stigma I placed these species in *Sorocephalus*, but found when preparing a key that these plants separated out from the rest of the genus. On re-examining all the specimens and preparing in a tabulated form the differences and resemblances between these doubtful specimens and species of *Spatalla* and *Sorocephalus*, I came to the conclusion that those hitherto considered as belonging to *Spatalla* and the one regarded as a *Sorocephalus* belonged to neither genus, and to accommodate them I have founded the genus *Spatallopsis*.



1.

1. Spatalla gracilis, *Knight*.
2. Sorocephalus imberbis, *R. Br.*

2.

The genus *Spatallopsis* differs from *Spatalla*, Salisb., principally in having a regular calyx and a conical stigma. From *Sorocephalus* it differs in having a quadrangular calyx tube $\frac{1}{3}$–$\frac{1}{2}$ the length of the whole calyx, in the style being inserted obliquely on the ovary and not constricted at the base, and in having the inflorescence in the form of a cylindric spike or raceme and not globose. In vegetative characters there is no difference, all three genera having simple, entire, usually filiform leaves. The cylindric inflorescence, however, gives the species of *Spatallopsis* more the appearance of a *Spatalla* than of a *Sorocephalus*.

Spatallopsis, *Phillips*, gen. nov. [Proteaceae-Proteeae]; *Spatallae*, Salisb. et *Sorocephalo*, R. Br. proxima sed ab illa calycis symmetria et stigmate conico vel clavato, et ab hac calycis tubo quadrangulo, floribus in spicam vel racemum cylindricum confertis et stylo haud basi constricto differt.

Flores hermaphroditi. *Capitula* parva 2–4-flora, in spicam vel racemum terminalem solitarium vel 2–9-natum disposita, sessilem vel subsessilem. *Bracteae* ovatae vel lanceolatae. *Involucri squamae*

basi connatae, bilabiatae ; labium inferius fere ad basin tripartitum : segmenta ciliata, pilosa vel glabra. *Calyx*, 4-lobus, ad $\frac{1}{2}$–$\frac{1}{3}$ tubulosus ; tubus quadrangulus, pubescens vel glaber ; lobi aequales, spathulato-lineares, barbigeri et villosi. *Stamina* 4 ; antherae subsessiles, ellipticae, apice glandibus minutis instructae. *Ovarium* obovatum vel obovato-oblongum, hirsutum vel villosum, aliquando subpedicellatum. *Stylus* filiformis, raro attenuatus, supra rectus vel curvus, saepe oblique ovario insidens, glaber. *Stigma* conicum vel clavatum, rectum vel curvum. *Squamae* hypogynae 4, lineares. *Fructus* obovatus vel globosus, fere subpedicellatus, hirsutus vel glaber.

Frutex parvus. *Folia* filiformia vel teretia, acuta, mucronata, supra unisulcata, pilosa vel glabra.

Species 5, Capenses.

Clavis specierum.

Folia 4–9 mm. longa.
  Folia mucrone obtuso.
    Folia pilosa ; stigma conicum ... 1. *S. ericaefolia.*
    Folia glabra ; stigma clavatum ... 2. *S. confusa.*
  Folia mucrone acuto ... ... 3. *S. caudaeflora*
Folia 1–2 cm. longa.
  Folia 1–1·5 cm. longa ; bracteae glabrae 4. *S. caudata.*
  Folia 1·5–2 cm. longa ; bracteae pilosae 5. *S. propinqua.*

1. **S. ericaefolia**, *Phillips*. *Rami* glabri, demum pubescentes. *Folia* 4–6 mm. longa, recta, apice paullo incurva, linearia, apice obtusa, minute punctata, infra convexa, supra unisulcata, pilosa, demum glabra. *Capitula* 3–4-flora in spicis terminalibus solitariis vel adnatis 1·2–2·5 cm. longis. *Bracteae* 6 mm. longae, ovato-lanceolatae, acuminatae, apice acutae, ciliatae, pilosae. *Involucrum* 4 mm. longum, bilabiatum, pilosum ; labium inferum tripartitum ; segmenta lateralia 3 mm. longa, ovata, acuminata, apice acuta, ciliata ; segmentum medium 3 mm. longum, lanceolatum, acuminatum, apice acutum, ciliatum. *Tubus calycis* 3 mm. longus, superne pubescens, basi glaber; laminae 4 mm. longae, spathulato-lineares, villosae, apice dilatato 0·7 mm. longo elliptico obtuso barbigero villoso. *Stamina* 7 mm. longa. *Stylus* 5·5 mm. longus, filiformis, oblique ovario insidens. *Stigma* 0·33 mm. longum, conicum. *Ovarium* 2 mm. longum, obovatum, hirsutum. *Squamae* hypogynae 1·5 mm. longae, lineares, acuminatae, apice acutae. *Fructus* 3 mm. longus, obovatus, pilosus.

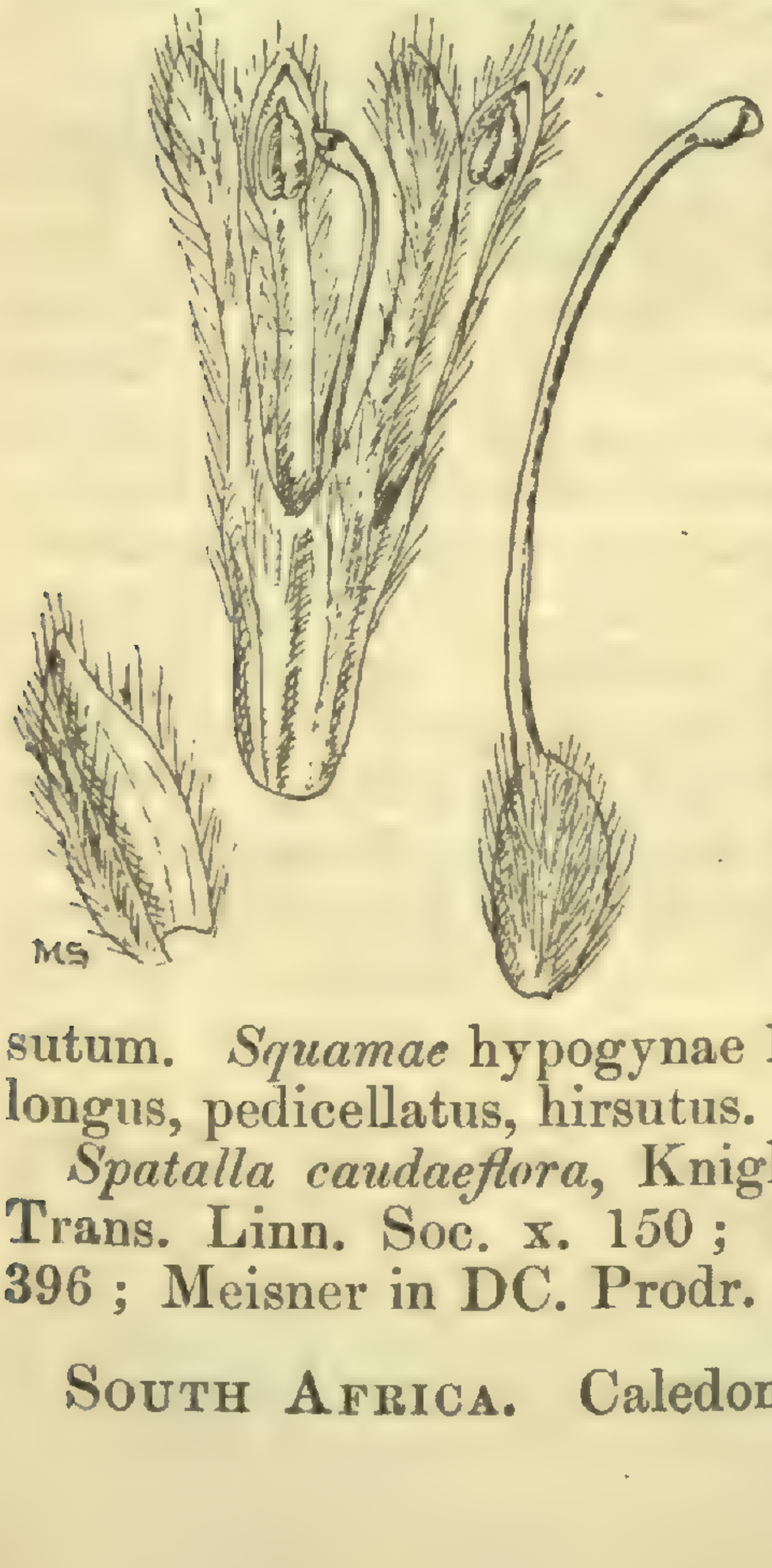
Spatalla ericaefolia, Knight, Prot. 75.

South Africa. Verhoode Valley, *Niven* ; without precise locality, *Masson* ; no collector in *Herb. Forsyth.*

2. **S. confusa,** *Phillips*. *Rami* pubescentes vel glabri. *Folia* 1 cm. longa, circiter 1 mm. lata, apice subobtusa, minute mucronata, glabra. *Capitula* 2–4 flora, in racemis subsessilibus terminalibus solitariis vel 2–3-natis 1·5–2 cm. longis. *Bracteae* 4 mm. longae, lanceolatae, apice acutae, ciliatae, glabrae; labium inferum tripartitum; segmenta inaequalia. *Tubus calycis* 3·5 mm. longus, glaber; laminae 5 mm. longae, spathulato-lineares, ciliatae, sparse pilosae vel glabrae, apice dilatato elliptico obtuso barbigero villoso. *Stamina* 1 mm. longa. *Stylus* 6 mm. longus, filiformis, supra curvus, oblique ovario insidens. *Stigma* 5 mm. longum, clavatum. *Ovarium* 2 mm. longum, villosum. *Squamae* hypogynae 1 mm. longae, lineares.

South Africa. Clanwilliam Div.: Ezelbank, *Drège*; *Schlechter*, 8838; Ceres Div.: Gydouwberg, *Schlechter*, 10225; Schoongezigt, *Schlechter*, 10180. Prince Albert Div.: Zwartberg Pass, *Bolus*, 11627.

3. **S. caudaeflora,** *Phillips*. *Rami* pilosi. *Folia* 0·6–1 cm. longa, linearia, apice acuta, mucronata, minute sed distincte punctata, pilosa. *Capitula* 3–4-flora in spicis cylindricis terminalibus solitariis 2·5–4 cm. longis. *Bracteae* 4 mm. longae, lanceolatae, apice subobtusae, ciliatae, pilosae. *Pedunculus* 0·75 mm. longus. *Involucrum* bilabiatum; labium inferum tripartitum; segmenta lanceolata, apice subacuta, longe denseque ciliata, pilosa. *Tubus calycis* 2 mm. longus, superne pubescens, inferne glaber; laminae 4 mm. longae, spathulato-lineares, hirsutae, apice dilatato 1 mm. longo ovato subobtuso barbigero dense villoso. *Stamina* 0·75 mm. longa. *Stylus* 5 mm. longus, filiformis, supra curvus, oblique in ovario insertus. *Stigma* 5 mm. longum, globoso-conicum. *Ovarium* 1 mm. longum, subpedicellatum, hirsutum. *Squamae* hypogynae 1 mm. longae, lineares. *Fructus* 3 mm. longus, pedicellatus, hirsutus.



Spatalla caudaeflora, Knight, Prot. 75; *S. Thunbergii*, R.Br. in Trans. Linn. Soc. x. 150; Roem. and Schultes, Syst. Veg. iii. 396; Meisner in DC. Prodr. xiv. 310 (excl. var.).

South Africa. Caledon Div.: Zwartberg, *Niven*.

4. **S. caudata**, *Phillips*. *Rami* glabri vel sparse pilosi. *Folia* 1–1·5 cm. longa, linearia, apice acuta, mucronata, aliquid pilosa vel glabra. *Capitula* 3–4-flora, in racemis sessilibus terminalibus cylindricis solitariis vel 4-natis 2·5–6 cm. longis. *Bracteae* 5 mm. longae, ovatae, subacuminatae, apice acutae, minute ciliatae, glabrae. *Pedunculus* 1 mm. longus, pubescens. *Involucrum* bilabiatum; labium inferum tripartitum; segmenta lateralia ovata, apice acuta, minute ciliata, pubescentia vel glabra; segmentum medium lanceolatum. *Tubus calycis* 2 mm. longus, superne pubescens, inferne glaber; laminae 4 mm. longae, spathulato-lineares, villosae, apice dilatato 1 mm. longo ovato acuto barbigero dense villoso. *Stylus* 5 mm. longus, filiformis, supra curvus, vix oblique ovario insidens, persistens. *Stigma* 0·5 mm. longum, conicum, obliqum. *Ovarium* obovato-oblongum, villosum. *Fructus* subpedicellatus, 4 mm. longus, globosus, superne pilosus.

Spatalla caudata, R.Br. in Trans. Linn. Soc. x. 150; Roem. and Schultes, Syst. Veg. iii. 396; Meisner in DC. Prodr. xiv. 310; *Protea caudata*, Thunb. Diss. Prot. 26 t. 2.

South Africa. Caledon Div.: Palmiet River, *Masson*; without precise locality in *Herb. Forsyth* (no collector).

5. **S. propinqua**, *Phillips*. *Rami* sparse pilosi. *Folia* 1·7–2 cm. longa, filiformia, apice acuta, mucronata, pilosa. *Capitula* 3–4-flora, in racemis terminalibus pedunculatis circiter 9-natis 5–8 cm. longis. *Bracteae* 5 mm. longae, lanceolatae, apice subacutae, ciliatae, pilosae. *Pedunculus* 1 mm. longus, hirsutus. *Involucrum* 4 mm. longum, bilabiatum, pilosum; labium inferum tripartitum; segmenta lateralia, ovata, apice acuta, ciliata; segmentum medium lineare, ciliatum. *Tubus calycis* 2·5 mm. longus, glaber; laminae 3·5 mm. longae, spathulato-lineares, villosae, apice dilatato 1 mm. longo ovato obtuso barbigero dense villoso. *Stylus* 5 mm. longus, cylindricus, oblique ovario insidens. *Stigma* 0·5 mm. longum, conicum, obliqum. *Ovarium* 1·5 mm. longum, oblongum, villosum. *Fructus* subpedicellatus, 2 mm. longus, obovatus, hirsutus.

Spatalla propinqua, R.Br. in Trans. Linn. Soc. x. 150; Meisner in DC. Prodr. xiv. 309; *Protea australis*, Poir. Suppl. iv. 579.

South Africa. Without precise locality, *Auge*.

XLIII.—INDIAN SPECIES OF IMPATIENS.

GENERIS IMPATIENS SPECIES INDICAE NOVAE ET MINUS RITE COGNITAE A CL. A. MEEBOLD DETECTAE.

J. D. Hooker.

I. Species Himalayae borreali-occidentalis incolae.

1. **I. Meeboldii**, *Hk. f.*, sp. nov. ; *I. Flemingii*, Hk. f. affinis, differt foliis oppositis et floribus minoribus subumbellulatis.

Herba gracilis, erecta, micrantha, caule 2–3 dm. longo simplici stricto inferne longe nudo superne paucifoliato. *Folia* 3–5 cm. longa, opposita vel superiora fasciculata, suprema sessilia, inferiora petiolata, membranacea, ovata vel ovato-lanceolata, acuminata, minute spinuloso-serrulata, utrinque 6–10-nervia, inferiora in petiolum gracilem 2–3 cm. longum angustata ; glandulae infrapetiolares minutae, globosae. *Pedunculi* ex axillis supremis, erecti, foliis subaequilongi, imo apice 3–6-flori ; pedicelli breves, capillares, umbellati vel breviter racemosi ; bracteae minutae, ovato-lanceolatae, subverticillatae, persistentes. *Flores* 6–8 mm. expansi, albi, apicibus sepalorum et labelli purpureis ; raphides 0. *Sepala* 2, ovata, obtusa, 2 mm. longa. *Vexillum* orbiculare, 5 mm. diametro, conchiforme, muticum, dorso rotundatum. *Alae* sessiles, angustae, 1–1·2 cm. longae ; lobus basalis parvus, oblongus, distalis duplo vel triplo longior, infra medium semilunaris, dein linearis, apice rotundatus ; auricula dorsalis obscura. *Labelli* limbus scaphiformis, ad 6 mm. longus, ascendens, cuspidatus ; calcar limbo aequilongum vel paullo longius, rectum. *Filamenta* anguste linearia ; antherae minutae, didymae. *Ovarium* ellipsoideum. *Capsulae* clavatae vel oblongae, acutae, 1·2–1·3 cm. longae, oligospermae. *Semina* oblongo-obovoidea, 3–5 mm. longa, laevia, castanea.

Kashmir. Gurais, 2440 m., Aug. 1905, *A. Meebold*, 2467.

A very distinct little species, allied to the opposite-leaved variety of *I. brachycentra*, Kar. et Kir. in the serrulate leaves, but differing in these being opposite, in the minute sepals, the long spur of the lip and the capsule.

2. **I. pahalgamensis**, *Hk. f.*, sp. nov. ; *I. racemosae*, DC. affinis, differt caule robusto, foliis crassioribus, floribus roseis, capsula apice rotundata seminibusque tuberculatis.

Herba erecta, 3–4 dm. alta, glaberrima, minutiflora, caule subsimplici robusto inferne longe nudo. *Folia* 4–5 cm. longa, alterna, conferta, petiolata, crassiuscula, ovata, acuta, grosse crenata setulis nunc interjectis, basi acuta vel rotundata, petiolo 1–2 cm. longo, nervis utrinque 6–8 ; glandulae infrapetiolares pulvinatae vel 0. *Pedunculi* erecti, foliis subaequilongi, 3–6-flori ; pedicelli florentes breves, fructiferi 1–2 cm. longi ; bracteae 2–4 mm. longae, lineares vel lineari-lanceolatae. *Flores* 3–4 mm. expansi, rosei ; raphides 0. *Sepala* 2, ovata vel ovato-rotundata, obtuse cuspidata, 4 mm. longa, inaequilatera. *Vexillum* orbiculare, cucullatum, 4 mm. latum, dorso carinatum, carina apice rostellata. *Alae* ? *Labelli* limbus late infundibularis vel cymbiformis, in calcar limbo brevius incurvum attenuatus, ore horizontali acuto vel cuspidato. *Filamenta* gracilia ;

antherae minimae, didymae, fere liberae. *Ovarium* ellipsoideum, acutum. *Capsulae* anguste ellipsoideae vel lineari-oblongae, 1·5–2 cm. longae, rectae vel incurvae, apice rotundatae, deflexae, oligospermae. *Semina* obovoideo-oblonga, 3–5·5 mm. longa, tuberculata, pallida.

Kashmir. Pahalgam, 2440 m., June, 1905, *A. Meebold*, 2464.

The specimens are few and not in very good condition. The wings in bud are short, broad and sessile. The spur of the lip is sometimes subinflated. The capsules are sausage-shaped.

II. Species Peninsulae occidentalis incolae.

* *Herbae; folia opposita; inflorescentia simpliciter pedicellata.*

\+ Sepala linearia, labelli limbum aequantia; semina laevia, nitida.

3. **I. chinensis**, *Linn.*, forma caule gracili, foliis 3–5 cm. longis lineari- vel obovato-oblongis basi angustatis fere integerrimis subtus saepe asperulis, floribus 1·5–2 cm. expansis roseo-purpureis, calcare 3–5 cm. longo, capsulis 1 cm. longis oligospermis.

Mysore. Aligalhatti, 1065 m., Feb., 1908, *A. Meebold*, 8258, et Chickenatti, 915 m., Nov. 1908, 10,703.

4. **I. rupicola**, *Hk. f.*, sp. nov.; *I. chinensi* affinis, foliis integerrimis, floribus capsulisque multo minoribus et labelli calcare minuto distincta.

Herba 3–4 dm. alta, erecta, fere glaberrima, parviflora, caule gracili simplici vel parce ramoso, internodiis elongatis. *Folia* opposita, sessilia vel brevissime petiolata, 3–8 cm. longa, submembranacea, oblonga, obovato-oblonga vel linearia, acuta, integerrima vel subserrata, basi rotundata, cordata vel acuta, nervis obscuris; glandulae infrapetiolares subulatae vel 0. *Inflorescentia* simpliciter pedicellata; pedicelli solitarii vel bini, gracillimi, 3–4 cm. longi, glabri vel puberuli, patuli vel fructiferi deflexi. *Flores* 1·5–2 cm. expansi, rosei vel roseo-purpurei; raphides 0. *Sepala* 2, linearia, acuminata, 7–10 mm. longa, 3-nervia, glabra, raro pilosa. *Vexillum* orbiculare, cucullatum, 8–10 mm. diametro, costa dorso carinata, carina mucronata ima basi gibba. *Alae* late stipitatae, 1·2–1·5 cm. longae; lobus basalis parvus, trigonus, erectus, distalis multo major, stipitatus, orbicularis vel obovatus; auricula dorsalis rotundata, porrecta vel decurva. *Labelli* limbus profunde cymbiformis, ore ascendente obtuso apiculato, calcare minimo incurvo. *Filamenta* subulata; antherae connatae, decurvae. *Ovarium* rectum, apice acutum, incurvum. *Capsulae* ellipsoideae, breviter stipitatae, longe acute rostratae, 12–15 cm. longae, polyspermae. *Semina* orbicularia, compressa, 2–2·5 mm. diametro, laevia, atra vel castanea, nitida.

Bombay. Belgaum: North Hills, *Dr. Ritchie*, 120; *I. H. Burkill*, Nov. 1902, 16,972; N. Kanara, Sept., 1891, *Talbot*, 2514; Castle Rock, 610 m., Oct. 1908, *A. Meebold*, 10,719; Mysore, Shimoga, 610–915 m., *A. Meebold*, 14,720; Poona distr., Kandala, 610 m., Sept. 1907, *A. Meebold*, 8813.

I. rupicola may prove to be a small flowered and fruited, almost spurless state of *I. chinensis*, which it seems to represent in the Western Ghats from the latitude of Goa to that of Poona.

5. I. Kleinii, *Wight & Arn.*

MYSORE. Western Ghats: Shukravarsanti, 1065 m., Nov. 1908, *A. Meebold*, 10,700; Kulhutty: mont. Bababuden, 1830 m., *A. Meebold*, 10,705; Talguppa, 610 m., Oct. 1908, *A. Meebold*, 10,711; Gersoppa Falls, 610 m., Oct. 1908, *A. Meebold*, 10,713.

KANARA BOR. Castle Rock, 610 m., Oct. 1908, *A. Meebold*, 10,714–10,717.

KONKAN BOR. Poona Distr.: Lonauli, 610 m., Sept. 1907, *A. Meebold*, 8910.

The eight numbered sheets of this species collected by Mr. Meebold present great variety of habit and foliage, but singular correspondence in floral organs and fruit. In small specimens the stems are 1·5–2 dm. long or high, erect or diffusely branched, in larger they exceed 3 dm. The leaves are sessile or very shortly petioled, quite glabrous, 2–8 cm. long, orbicular, ovate, elliptic, oblong or linear, nearly quite entire, acute or obtuse, base rounded or contracted, very rarely cordate, the upper ones biglandular at the base. The pedicels are 1–2 cm. long, always glabrous, solitary or binate, lengthening in fruit but rarely equalling the leaves. The minute flowers are white or pale pink or violet-purple, rarely pilose. The linear, acute or subacute sepals vary in breadth and are 1–3-nerved. The small, hooded, apiculate, green standard is dorsally keeled. The obovate or rounded distal lobe of the wings is stipitate for about its own length with no trace of a basal lobe or dorsal auricle on the stipes. The slender spur of the lip is usually about twice the length of the limb, and usually strongly incurved. The filaments are very slender, nearly equal in length, and the minute anthers nearly erect. The ripe capsules are 1–1·5 cm. long, linear or turgidly ovoid, straight, shortly stipitate, acutely beaked, few seeded; seeds orbicular, compressed, 2·5 mm. diam., black, shining.

I. Kleinii is the commonest species in the Western Ghats from Poona to Travancore; it has not been recorded from any central or eastern district of the Peninsula.

6. I. pusilla, *Heyne ex Wall.* Cat. n. 4745; Hk. f. & T. in Journ. Linn. Soc. ser. iv. (1860), 122.

I. inconspicua, Benth. in Wall. Cat. n. 4741; Wight et Arn. Prodr., 139; Wight Ic. t. 970; Dalz. & Gibs. Bomb. Flora, 43; Hk. f. Fl. Brit. Ind. i. 447, et in Rec. Bot. Surv. Ind. iv. (1906) 41, 46; Woodr. in Journ. Bomb. Nat. Hist. Soc., xi. ii. (1897) 266; T. Cooke, Bomb. Flor. i. 171; Herb. Wight, Kew distrib. n. 313.

I. inconspicua, var. 2 *pusilla*, var. 3 *filiformis*, var. 4 *ramosissima*, Hk. f. Fl. Brit. Ind. i. 448; T. Cooke, Bomb. Flor. i. 172.

I. oppositifolia, Herb. Wight ex Wall. Cat. no. 4743B, non Linn.

I. filiformis, Wight & Arn., l.c. 140; Herb. Wight, Kew distrib. n. 315.

I. ramosissima, Dalz. in Hook. Kew Journ. Bot. iii (1851), 230.

I. rosmarinifolia? Retz, Wight Ic. t. 750.

I. Perrottetii, Turz. in Bull. Soc. Nat. Mosc. xxxvi. (1863) 594; Hk. f. in Hook. Ic. Pl. t. 2909.

I. tenella, Herb. Wight, Kew distrib. n. 314, *non Heyne.*

WESTERN GHATS, from the Konkan to Travancore, 915–2440 m.

Var. **nematostachys**, *Hk. f.*; caule 2 dm. alto subsimplici vel ramoso ramisque filiformibus rigidis, internodiis elongatis, foliis coriaceis, vexilli costa dorso gracili basi vix gibbosa.

Herba gracillima, glaberrima, minimiflora, 2 dm. alta, caule erecto stricto vel flexuoso laxe ramoso ramisque fere filiformibus rigidis roseis purpureisve, internodiis elongatis. *Folia* 2–3 cm. longa, opposita, subsessilia, coriacea, superiora linearia vel linearioblonga, acuta, integerrima vel minute spinuloso-serrulata, basi rotundata, eglandulosa, inferiora latiora, basi angustata, nervis obscuris; glandulae infrapetiolares 0. *Pedicelli* breves, solitarii, uno latere puberuli, fructiferi foliis breviores, deflexi. *Flores* ad 5 mm. expansi, albi, intus basi punctis lineis 2 purpureis notati. *Sepala* 2, linearia, acuminata, 4 mm. longa, uninervia. *Vexillum* orbiculare, fornicatum, 3 mm. diametro, costa dorso carinata, carina apice cuspidata. *Alae* sessiles, 4·5 mm. longae; lobus basalis oblongo-rotundatus, distalis triplo major, dolabriformis, apice rotundatus; auricula dorsalis obscura. *Labellum* cymbiforme, 4 mm. longum, acuminatum, subtus rotundatum, ecalcaratum. *Filamenta* angusta; antherae minimae. *Ovarium* ovoideum, rostratum. *Capsulae* ellipsoideae, 6 mm. longae, medio turgidae, utrinque attenuatae, rectae, oligospermae. *Semina* late obovoidea vel rotundata, 1·5 mm. longa, laevia, nitida, atra, strophiolo basi albo.

Mysore occident. Kulhutty: mont. Bababuden, 1830 m., Nov. 1908, *A. Meebold*, 10,707.

In its erect, rigid, filiform stems and coriaceous, remote pairs of leaves, var. *nematostachys* differs greatly from ordinary forms of *I. pusilla*, as it does further in wanting the gibbus at the base of the vexillum. Mr. Meebold notes that the flowers are white with two purple streaks or lines of spots in the throat.

I. pusilla has been a "non rite cognita" species, of which the only known specimens were imperfect ones in the Wallichian Herbarium, collected in the Bababuden Hills by Heyne. Wight & Arnott in the Prodromus Florae Penins. Ind. Or., cite it as a synonym of *I. inconspicua*, Benth., under which they note "These two synonyms appear at first sight to belong to very distinct species; but a more careful examination suggests that *I. inconspicua* is a luxuriant, and *I. pusilla* a starved form of the same plant; at least we can perceive no important mark by which to separate them." The fact is that *I. pusilla* is as variable and common a species in the Western Ghats as *I. oppositifolia* and *I. Kleinii*, from which it may be distinguished by the cymbiform spurless or almost spurless lip. Its complicated synonymy being now I hope satisfactorily cleared up, I am disposed to adopt the name given to it by its discoverers.

I have seen no specimens from the central or eastern districts of the Peninsula, but a specimen in Herb. Hort. Bogor. received from the Calcutta Herbarium and ticketed "Assam, Col. Jenkins," suggests the possibility of its occurrence in the Eastern Ghats or West of the Peninsula.

7. **I. Nataliae**, *Hk. f.*, sp. nov.; *I. Lawii* affinis, floribus multo minoribus albis, vexilli costa ecarinata, labello infundibulari capsulisque multo minoribus distincta.

Herba 2 dm. alta, e basi ramosa, glaberrima, parviflora, ramis gracilibus ascendentibus. *Folia* 2–3 cm. longa, opposita, sessilia,

oblonga vel lineari-oblonga, firma, inferiora obovata, acuta vel obtusa, spinuloso-serrata vel integerrima, enervia, costa subtus prominula ; glandulae infrapetiolares 2, setaceae, deflexae vel 0. *Inflorescentia* simpliciter pedicellata ; pedicelli foliis breviores, solitarii, capillares, fructiferi paullo elongati, deflexi. *Flores* vix 1 cm. expansi, exsiccati albi, labello reticulatim roseo picto; raphides 0. *Sepala* 2, linearia, acuminata, 4–5 mm. longa, uninervia. *Vexillum* amplum, orbiculare vel late ellipticum, paullo fornicatum, costa dorso gracili apice mucronata. *Alae* 9–10 mm. longae, anguste stipitatae ; lobus basalis parvus, trigonus, truncatus, distalis multo major, obovatus vel dolabriformis ; auricula dorsalis magna, protrusa vel decurva. *Labellum* infundibulare, ore elongato ascendente, in calcar breve uncinatum attenuatum. *Filamenta* brevia, filiformia ; antherae minutae, didymae. *Ovarium* anguste ovoideum, rectum, acuminatum. *Capsulae* parvae, fere globosae, ad 1 cm. longae, brevissime stipitatae, acute rostratae, oligospermae. *Semina* globosa, ad 2 mm. diametro, laevia, atra, nitida.

MYSORE BOR. OCCIDENT. Shimoga : Kumsi, 610–915 m., Oct. 1908, *A. Meebold*, 10,718.

Mr. Meebold describes the flowers as white with a pink spur ; at his request I have named it after his venerated mother.

\+ + Sepala ovata ; folia superiora verticillata.

8. **I. Gardneriana**, *Wight* Ic. t. 1050 ; Hk. f. Fl. Brit. Ind. i. 445, et in Rec. Bot. Surv. Ind. iv. (1906) 41, 46.

I. *setosa*, Hk. f. & Thoms. in Journ Linn. Soc. iv. 123 ; Fl. Brit. Ind. i. 445.

KANARA AUSTRAL. Sirade : confinibus Mysore, Nov. 1908, *A. Meebold*, 10,712.

The specimens are poor but I think identifiable with *I. Gardneriana*, which had not previously been collected north of Malabar.

** *Frutex ; folia inferiora opposita, superiora verticillata ; inflorescentia simpliciter pedicellata ; sepala ovata ; semina tuberculata.*

9. **I. bababudenensis**, *Hk. f.*, sp. nov. ; *I. Leschenaultii*, Wall. affinis, differt foliis longe petiolatis longe acuminatis 6–7 nerviis, floribus multo majoribus, vexillo orbiculari et alarum lobo basali distali multo minore.

Frutex sexpedalis, valde ramosus, glaberrimus, caule inferne lignoso. *Folia* 5–10 cm. longa, inferiora opposita, superiora 3–4-natim verticillata, petiolata, firma, ovata vel ovato-lanceolata, caudatim acuminata, crenato-serrata setulis interjectis 0, basi in petiolum gracilem 1–4 cm. longum angustata, costa gracili, nervis utrinque 7–8 ; glandulae infrapetiolares 0. *Inflorescentia* simpliciter pedicellata; pedicelli ex axillis superioribus pauci, solitarii, graciles, florentes foliis breviores, fructiferi paullo elongati, erecti. *Flores* ad 3 cm. expansi, albi ; raphides 0. *Sepala* 2, late ovata, longe cuspidata, 5–6 mm. longa, 5-nervia. *Vexillum* amplum, orbiculare, 1·2–1·5 dm. diametro, apice bilobum, costa dorso carinata apice in rostrum recurvum validum producta. *Alae* sessiles, 1·5–2 cm. longae ; lobus basalis subrotundatus, distalis bis terve longior, obovatus vel dolabriformis, dorso infra apicem lente excisus ; auricula dorsalis rotundata. *Labelli* coriacei limbus 1–1·5 cm. longus, alte cymbiformis, in calcar robustum incurvum 1·5–2 cm. longum attenuatus,

ore 1–1·5 cm. longo horizontali acuto. *Filamenta* brevissima, subulata; antherae majusculae. *Ovarium* fusiforme, rectum, acutum. *Capsulae* gibbosim ventricosae, sessiles, acute rostratae, 1–1·2 cm. longae, oligospermae. *Semina* orbicularia vel obovoidea, subcompressa, 4 mm. longa, rugosa, atro-brunnea.

Mysore occident. Kulhutty; mont. Bababuden, 1830 m., Nov. 1908, *A. Meebold*, 10,706.

A near ally of *I. Leschenaultii*, DC., differing in the larger, long-petioled, caudately acuminate leaves, long pedicels, and the basal lobe of the wings much shorter than the distal.

III. Species Manipurenses.

* *Sepala lateralia* 2.

\+ Inflorescentia pedunculata.

10. **I. spissiflora**, *Hk. f.*, sp. nov.; herba elata ramosa *I. tripetalae*, Roxb., affinis, differt habitu, caule ramisque rigidis foliosis, foliis omnibus oppositis breviter petiolatis oblongis acutis, glandulis infrapetiolaribus raris vel 0, pedunculo elongato seminibusque minoribus laevibus glabris.

Herba 6–8 dm. alta, glaberrima vel foliis novellis puberulis, pariflora, caule ramisque rigidis. *Folia* 8–12 cm. longa, opposita, patula, breviter petiolata, firma, oblonga, acuta vel acuminata, integerrima vel minute serrulata, basi in petiolum 1–2 cm. longum angustata, nervis utrinque 12–16 gracillimis; glandulae infrapetiolares paucae, subulatae vel 0. *Inflorescentia* pedunculata; pedunculi 4–7 cm. longi, stricti, graciles vel robusti, patuli, imo apice 2–6-flori; pedicelli florentes 0·5–1·5 cm. longi, fructiferi 2–3 cm. longi; bracteae minutae, ovatae, acutae. *Flores* ad 2–3 cm. expansi, plus minusve carnosi. *Sepala* 2, ovata, 4–6 mm. longa, recta vel subfalcata, obtusa vel acuta, 5-nervia. *Vexillum* orbiculare vel oblatum, 1–1·4 cm. diametro, muticum, costa dorso in gibbum magnum late conicum obtusum tumescente. *Alae* 2·5–3 cm. longae, sessiles vel late breviter stipitatae; lobus basalis rotundatus, distalis vix longior, late dolabriformis; auricula dorsalis magna, reniformis, inflexa. *Labelli* limbus saccatim infundibularis, incurvus, 1·4–1·6 cm. longus, antice paullo supra basin rotundatus, repente in calcar limbo dimidio brevius incurvum attenuatus, ore horizontali 1·2–1·5 cm. longo subacuto. *Filamenta* gracilia; antherae parvae, obtusae. *Ovarium* subfalcatum, acuminatum. *Capsulae* anguste fusiformes, 1·8–2 cm. longae, utrinque attenuatae, fere rectae, acuminatae, oligospermae. *Semina* orbicularia, compressa, 2–2·5 mm. diametro, glabra, castanea.

Manipur. Kowpon, 1525 m., Nov. 1907, *A. Meebold*, 5879; Barak, 915–1220 m., *A. Meebold*, 6073, 6285, 6367.

11. **I. teneriflora**, *Hk. f.*, sp. nov.; herba foliis alternis longe petiolatis lineari-oblongis 0·5–1·5 dm. longis, floribus inter majoribus longe calcaratis.

Herba? elata, ramosa, fere glaberrima, longifolia, floribus majusculis, ramis ramulisque firmis. *Folia* 0·5–1·5 dm. longa, alterna, longe petiolata, membranacea, juniora sparsim setulosa, oblongo-lanceolata vel lineari-oblonga, longe acuminata, crenata setulis

interjectis 0, basi nuda vel pilis raris ciliata, in petiolum gracilem 3–8 cm. longum sensim angustata, costa subtus prominula, nervis utrinque in foliis parvis 5–6, in foliis maximis 10–14 ; glandulae infrapetiolares 0. *Pedunculi* foliis multo breviores, 3–5 cm. longi, 1-6-flori ; pedicelli filiformes, 2–3 cm. longi ; bracteae 3–6 mm. longae, lanceolatae, longe acuminatae, deciduae. *Flores* ad 4 cm. expansi, tenerrimi ; raphides 0. *Sepala* 2, late ovata vel oblonga, 8–10 mm. longa, acuta vel acuminata, membranacea, 3–5-nervia. *Vexillum* oblongo-ovatum, obtusum, fornicatum, muticum, dorso rotundatum, costa dorso carinata. *Alae* 2·5–2·7 cm. longae, subsessiles, basi cuneatae vel paullo constrictae ; lobus basalis amplus, rotundatus, distalis paullo longior, late dolabriformis, obtusus ; auricula dorsalis magna, reniformis, inflexa. *Labellum* late infundibulare, sensim in calcar elongatum gracile apice involutum vel annulare attenuatum, totum incurvum 3–3·5 cm. longum, ore elongato ad 2 cm. longo acuminato horizontali. *Filamenta* gracilia, 6 mm. longa ; antherae in capitulum incurvum connatae, obtusae. *Ovarium* gracile, lente curvatum, acuminatum. *Capsulae* erectae, ad 2 cm. longae, fere lineares, strictae, compressae, basi attenuatae, apice acuminatae, polyspermae. *Semina* minuta, 1·5 mm. longa, oblonga, castanea, villis arillata.

Manipur. Laimatak, 1525 m., Nov. 1907, *A. Meebold*, 6500.

I. teneriflora is I think nearly allied to *I. Forrestii*, Hk. f., of Upper Burma and Western Yunnan at lat. 25·50 N., in which the leaves are broader and serrate. It is named in reference to the remarkable delicacy of the floral organs.

+ + Inflorescentia saepissime simpliciter pedicellata.

12. **I. longirama**, *Hk. f.*, sp. nov. ; *I. tripetalae*, Roxb., affinis, differt caule elato robusto vage ramoso, ramis valde elongatis divaricatis foliosis, ramorum ramulorumque nodis glandulis subulatis densissime confertis infra petiolos circumdatis.

Herba? metralis vel ultra, vage ramosa, puberula vel fere glaberrima, parviflora, caule ramisque teretibus rigidis, ramulis 4–6 dm. longis divaricatis. *Folia* 8–12 cm. longa, opposita et ternatim verticillata, firma, petiolata, elliptico-lanceolata, utrinque acuminata, crenulata vel serrulata, basin versus nunc ciliata, costa nervisque utrinque 10–12 gracillimis, petiolo gracili 2–3 cm. longo ; glandulae infrapetiolares subulatae, densissime confertae. *Inflorescentia* simpliciter pedicellata ; pedicelli 1–2 cm. longi, graciles. *Flores* ad 2 cm. expansi, rosei ? *Sepala* 2, ovata vel ovato-lanceolata, 2 mm. longa, uninervia. *Vexillum* oblate orbiculare, fornicatum, ad 1·5 cm. latum, costa dorso medio alte rostrata apice mutica. *Alae* 2·3 cm. longae, stipitatae ; lobus basalis rotundatus, distalis paullo longior, dolabriformis ; auricula dorsalis magna, protrusa vel inflexa, decurva. *Labelli* limbus saccatus, 2 cm. longus, basi rotundatus et antice calcare breve erecto limbo dimidio breviore instructus, ore horizontali acuto. *Filamenta* brevia, filiformia ; antherae obtusae. *Ovarium* subsigmoideo-falcatum, apice incurvo acuto. *Capsulae* 1–1·5 cm. longae, fusiformes, teretes, rectae vel falcatae, apice acutae, incurvae, oligospermae. *Semina* obovoidea, 2–3·3 mm. longa, rugulosa.

Manipur. Irang, 1220 m., Nov. 1907, *A. Meebold*, 5867.

I. longirama has the flowers, fruit and seeds of *I. tripetala*, a species which, under many forms, abounds in the Assam Valley and extends westwards in Northern Bengal to Dacca and perhaps further, but nowhere assuming the characters of *I. longirama*.

13. **I. tripetala**, *Roxb.*, var. **microscypha**, *Hk. f.*; caule gracili, foliis oppositis et alternis, inflorescentia breviter pedunculata vel simpliciter pedicellata, floribus parvis, capsulis 1 cm. longis oligospermis.

Herba gracilis, fere glaberrima, 3–4 dm. alta, parviflora, caule inferne nudo saepe lignoso simplici vel parce ramoso. *Folia* 5–12 cm. longa, opposita vel alterna, petiolata, membranacea, ovata vel ovato-lanceolata, acuminata, subintegerrima vel minute serrulata, basin versus nuda vel ciliata, in petiolum gracilem 1·7 cm. longum angustata, costa gracili, utrinque 8–14-nervia; glandulae infrapetiolares breves, paucae, plurimae vel 0, saepe confertae. *Inflorescentia* nunc simpliciter pedicellata, nunc breviter pedunculata, pedunculo 0·5–1 cm. longo 3–5-floro; pedicelli capillares, 1–2 cm. longi; bracteae minutae, ovato-lanceolatae. *Flores* ad 1·5–2 cm. longi, rosei, calcare albo; raphides 0. *Sepala* 2, ovata vel ovato-lanceolata, acuminata, 0·5–3 mm. longa. *Vexillum* orbiculare, muticum, fornicatum, costa dorso medio gibbo conico instructa. *Alae* late breviter stipitatae, 1·5–2 cm. longae; lobus basalis amplus, rotundatus, distalis paullo longior, inflexus, obovatus; auricula dorsalis magna, reniformis, inflexa. *Labelli* limbus late infundibularis, incurvus, 1·5–1·8 cm. longus, deorsum ad basin rotundatum sensim attenuatus, antice supra basin in calcar breve incurvum obtusum repente constrictus, ore amplo 1·5 cm. longo obtuso apiculato horizontali. *Filamenta* gracilia; antherae obtusae. *Ovarium* subclavatum, acuminatum. *Capsulae* erectae, 0·9–1·1 cm. longae, medio tumidae, ellipsoideae, utrinque attenuatae, acutae, oligospermae. *Semina* 2–3 mm. longa, pyriformia vel obovoidea, compressa, laevia, minute papillosa, castanea.

Manipur. Jhirighat, 450 m., Nov. 1907, *A. Meebold*, 5687; Bishenpur, *A. Meebold*, 6725.

A very frequent form, extending westwards to Bengal.

* * *Sepala lateralia* 4; *folia alterna*; *inflorescentia pedunculata.*

\+ Herba gracilis, parviflora.

14. **I. gibbisepala**, *Hk. f.*, sp. nov.; herba foliis ovato-lanceolatis crenatis, alarum lobo distali loriformi.

Herba gracilis, erecta, glaberrima, parviflora, caule ramoso, ramis erectis. *Folia* 6–10 cm. longa, alterna, longe petiolata, firma, ovata vel ovato-lanceolata, caudatim acuminata, crenata setulis interjectis, basi in petiolum gracilem 3–5 cm. longum angustata, nervis utrinque 8–10; glandulae infrapetiolares 0. *Inflorescentia* pedunculata; pedunculi foliis breviores, gracillimi, erecti, pauciflori; pedicelli 2–3 cm. longi; bracteae ovato-lanceolatae, 2–3 mm. longae. *Flores* aurei. *Sepala* 4, 2 exteriora oblonga, acuta vel cuspidata, plana, 6–7 mm. longa, ima basi uno latere in lobulum obtusum patulum vel decurvum producta, 2 interiora subulata, hyalina. *Vexillum* ovatum vel oblongum, acutum, ad 7 mm. longum, costa tenui. *Alae* sessiles; lobus basalis oblongus vel rotundatus, distalis triplo longior, 1·5 cm.

longus, loratus ; auricula dorsalis 0. *Labelli* limbus brevis, cymbiformis vel scaphiformis, in calcar gracile ad 3 cm. longum sensim attenuatus, ore ascendente mucronato. *Filamenta* brevia, late linearia ; antherae in capitulum connatae.

MANIPUR. Kapon, 2440 m., *A. Meebold*, 9231.

I. gibbisepala is closely allied to the Himalayan and Khasian *I. drepanophylla*, Hk. f., also a Manipur species (Bishenpur, alt. 900 m., *Meebold*, 5986) from which it differs in the longer, oblong, acute sepals which are remarkable for being produced at the base on one side into a prominent lobule. The specimens are scanty and indifferent and are devoid of capsules which, it may be presumed, are linear, very slender and many-seeded. The labellum is in some flowers almost tubiform with an erect mouth.

+ + Herbae vel fruticuli robusti, floribus majusculis vel amplis carnosis, alarum lobo distali oblongo vel dolabriformi.

15. **I. laevigata**, *Wall.*, Cat. no. 4753, var. **grandifolia**, *Hk. f.*; frutex foliis 1–2 dm. longis crenato-serratis setulis interjectis 0, bracteis oblongis, floribus albis flavo-tinctis.

Frutex ramosus, glaberrimus, grandiflorus, ramulis robustis teretibus. *Folia* 1–2 dm. longa, apices versus ramulorum conferta, alterna, petiolata, papyracea, exsiccata fusco-brunnea, nitida, oblonga, acuminata, grosse crenato-serrata, subtus pallidiora, basi in petiolum validum 3–5 cm. longum angustata, nervis utrinque 7–8 ; glandulae infrapetiolares 0. *Pedunculi* 4–5 cm. longi, medio 1–2-bracteati, 1–3 (?) -flori ; bracteae oblongae, 1–1·5 cm. longae. *Flores* ad 4 cm. expansi, carnosi, albi, flavo tincti, raphidibus instructi. *Sepala* 4, 2 exteriora orbicularia, 1·8–2 cm. diam., crasse carnosa, mutica vel apiculata, 2 interiora 2 cm. longa, falciformia, acuta, uno latere costata et incrassata. *Vexillum* amplum, reniformi-rotundatum, fornicatum, 2·5 cm. latum, dorso rotundatum, ecostatum, muticum. *Alae* sessiles, 2·5 cm. longae ; lobus basalis amplus, rotundatus, enervis, distalis paullo longior, angustior, panduriformis, apice bilobus ; auricula dorsalis rotundata. *Labellum* late infundibulare, in calcar robustum obtusum incurvum limbo subaequilongum sensim attenuatum, totum ad 2·5 cm. longum, crassum, ore horizontali ad 2 cm. longo. *Filamenta* 6–7 mm. longa, gracilia, superne incrassata et connata ; antherae obtusae. *Ovarium* falcatum, acuminatum.

MANIPUR. Barak, 1220 m., Nov. 1907, *A Meebold*, 6272.

The fleshy texture of the flowers renders them impossible of accurate analysis after being dried. They are described by Mr. Meebold as yellowish-white. In typical *I. laevigata* of the Khasia Hills they are straw-coloured streaked with red.

16. **I. odontosepala**, *Hk. f.*, sp. nov. ; frutex ? foliis 1–1·5 cm. longis fere integerrimis graciliter petiolatis, bracteis lanceolatis, sepalis 2 exterioribus ovato-oblongis cuspidatis.

Frutex? glaberrimus, floribus mediocribus, ramis ramulisque teretibus laevibus lignosis fistulosis. *Folia* apices versus ramorum conferta, 1–1·5 dm. longa, alterna, petiolata, firma, exsiccata atro-fusca, obtusa, oblanceolata vel oblongo-lanceolata, acuminata, integerrima vel obscure crenulata setulis interjectis, subtus concoloria, basi in petiolum gracilem 3–5 cm. longum angustata, costa

gracili, nervis utrinque 6–10 ; glandulae infrapetiolares 0. *Pedunculi* breves, 3·5 cm. longi, 1–4-flori ; pedicelli 1–2 cm. longi ; bracteae 1–1·5 cm. longae, lanceolatae, acuminatae. *Flores* ad 3–4 cm. expansi, flavi, rubro-striati, carnosuli, raphidibus instructi. *Sepala* 4, 2 exteriora 1·5–1·7 cm. longa, oblique ovato-oblonga, cuspidatim acuminata, basi rotundata, hilo laterali, 5–7-nervia, marginibus plus minusve dentatis, 2 interiora anguste lineari-elongata, acuminata, 1·5–2 cm. longa, membranacea, medio costata. *Vexillum* carnosum, orbiculare, 2·5 cm. latum, muticum, fornicatum, dorso carina crassa apice rotundata auctum. *Alae* sessiles, 2–2·5 cm. longae ; lobus basalis 1·5–1·8 cm. longus, oblongus, decurvus, apice rotundatus, distalis paullo longior, erectus, dolabriformis ; auricula dorsalis rotundata. *Labellum* cymbiforme, crasse carnosum, basi in calcar breve valde robustum incurvum obtusum attenuatum, ore horizontali, 2–2·5 cm. longo acuminato. *Filamenta* filiformia, 5 mm. longa ; antherae obtusae.

Manipur. Kapon, 2135 m., Nov. 1907, *A. Meebold*, 6491.

I have seen only two flowering peduncles, one with perfect flowers described above, the other with a much smaller flower in which the two wings are represented by four free spathulate organs much smaller than the sepals, and of which two are shorter and broader than the others. There are no stamens and the ovary is deformed.

17. **I. rubrolineata**, *Hk. f.*, sp. nov. ; herba foliis ovato-oblongis serrulatis, bracteis ovatis vel ovato-lanceolatis, sepalis 2 exterioribus oblique ovato-oblongis acuminatis.

Herba erecta, glaberrima, grandiflora, caule 5–6 dm. alto simplici rigido apice tantum folioso. *Folia* 6–10 cm. longa, alterna, petiolata, firma, ovato-oblonga, acuminata, serrulata, basi acuta, in petiolum gracilem 2–3 cm. longum angustata, nervis utrinque 6–8 ; glandulae infrapetiolares 0. *Pedunculi* 2–4-flori, petiolos subaequantes; bracteae ovatae vel ovato-lanceolatae, acuminatae, 1–1·2 cm. longae. *Flores* ad 4 cm. expansi, flavi, rubro-striati, carnosi, raphidibus instructi. *Sepala* 4, 2 exteriora ovato-oblonga, acuminata, 1·5–2 cm. longa, concava, 5–7-nervia, 2 interiora longiora, tenuissima, flaccida. *Vexillum* amplum, orbiculare vel oblatum, 3 cm. latum ; costa dorso supra medium breviter cristata. *Alae* 3–3·5 cm. longae, basi cuneatae ; lobus basalis amplus, late oblongus vel rotundatus, distalis longior et angustior, obovato-oblongus, apice dilatatus et emarginatus ; auricula dorsalis rotundata. *Labelli* limbus crassus, late infundibularis vel cymbiformis, 2·5–3 cm. longus, horizontalis vel ascendens, ore acuminato ; calcar limbo multo brevius, robustum. *Filamenta* 0·8–1·2 cm. longa, gracilia ; antherae majusculae, connatae. *Ovarium* fere rectum, acutum.

Manipur. Laimatak, 1525 m., Nov. 1907, *A Meebold*, 6275.

The solitary specimen described above is in very poor condition in respect of foliage.

I. laevigata, *I. odontosepala*, and the above all require to be studied in the living condition.

XLIV.—GARNOTIELLA.

Otto Stapf.

In 1896 I described *Garnotiella*, a new genus of *Gramineæ*, in Hooker's Icones Plantarum, tab. 2494. The name was suggested by its resemblance to and assumed affinity with *Garnotia*. It was based on a specimen collected by Vidal (no. 3994), in the Philippines. Some time ago, Mr. E. D. Merrill was good enough to call my attention to some specimens in his Philippine collections (no. 4322), which evidently represented the same plant and had been named *Andropogon leptos*, Steud., by Professor E. Hackel. The renewed examination of Vidal's specimen and its comparison with Hackel's description of *Andropogon leptos* left no doubt about the identity of the grasses and their position in *Andropogon*, if this genus is taken in the wide sense of Hackel's conception. This author placed it at the end of his sub-genus *Sorghum* as "species valde peculiaris." Steudel, on the other hand, enumerated it under the section *Chrysopogon*, and Nees named it, according to Steudel, *Chrysopogon tener* (MS.). As neither my own nor Hackel's description is quite complete or correct, it may be worth while to supplement and amend them with a view to establishing more clearly the sytematic position and status of the plant.

The mistake I made in comparing the grass with *Garnotia* was mainly due to my overlooking the rudimentary pedicels which are hidden away among the hairs surrounding the base of the spikelet, and in misinterpreting the awned innermost glume which in mature specimens like Vidal's readily becomes detached. Counting this glume as glume iii, to use Hackel's terminology, instead of as glume iv, the structural resemblance of the spikelets of *Garnotiella* and *Garnotia* becomes quite evident; moreover, it is supported by the general aspect of the inflorescence.

The rudimentary pedicels, that is the barren primary axis of the last divisions of the panicle, vary from 0·3–0·5 mm. in length, and from 0·03 to 0·005 mm. in diameter, and although—with the exception of the hyaline tips—multicellular in cross-section, are more or less transparent. They are ciliate, and overtopped by their own cilia and the hairs of the callus, some of which attain up to almost 1 mm. in length. The lower involucral glume has been described as nerveless; but under a high power, and when the glume is made sufficiently transparent, two pairs of extremely delicate nerves can be observed. They consist in cross-section of one or in the upper part of two extremely fine tracheids, about 3μ in diameter, and run towards the two apical teeth of the glume, leaving a slightly thinner middle band between them. The glume is rounded on the back, and possibly, under some circumstances, slightly concave between the nerve pairs as Steudel describes it. The upper involucral glume is distinctly laterally compressed and keeled. Flattened out, it also appears at first sight nerveless, or, owing to the fold which corresponds to the keel, one-nerved. The microscope, however, reveals also here the presence of extremely delicate nerves of the same character as in the lower glume; but there are only three of them, one along the middle line, and one on each side, slightly nearer to

the edge than to the keel. The lower floret is completely suppressed, unless a small scale which is sometimes present between the flower and the lower involucral glume is assumed to represent its floral glume or valve (glume iii of Hackel). It is absolutely nerveless, very delicate and sparingly ciliate at the top, and may attain as much as 0·5 mm. in length. In most cases I have, however, vainly searched for it; nor did Hackel observe it.

In describing *Garnotiella*, I took this scale to represent the palea; but in the light of my renewed investigation, I am strongly inclined to consider it as the rudimentary floral glume of the lower floret. The upper fertile floret consists then of its floral glume and the flower which, according to my observations, is destitute of lodicules, whilst Hackel mentions "lodiculae minutulae." The glume of this floret is distinctly bilobed to about $\frac{1}{3}$ to $\frac{2}{3}$ of its total length, the lobes being narrow, acute, and sparingly ciliolate near their tips. The flower is constantly diandrous, the anticous stamen being suppressed. The mature grain is broad-elliptic in cross-section with the longer axis in the median plane.

Taking into consideration the lateral compression which is particularly obvious in the upper involucral glume and the type of nervation which, however faint, is still preserved in the lower involucral glume, I cannot help thinking that *Garnotiella* approaches nearer *Chrysopogon* than *Sorghum*, and theoretically it can no doubt be reduced to the former, or, with Hackel, to *Andropogon*, *sensu lato*. But it approaches to no species in particular, and Hackel himself calls it "species valde peculiaris." To my mind it is a type as well marked and as easily recognisable as the most distinct genera in *Andropogoneae*, and quite worth being retained as a genus, perhaps allied and even derived from *Chrysopogon*, but differing from it in the extreme reduction of the parts of the spikelet, in size as well as in texture, and, to a certain extent, also in number. Owing to the fact, however, that it was already described as *Andropogon leptos* by Steudel, the specific name "*philippinensis*" proposed by me will have to give way to the older name "*leptos*," and the grass will therefore have to be called in future *Garnotiella leptos*.

XLV.—MISCELLANEOUS NOTES.

Mr. E. Bateson, of the Imperial College of Science and Technology, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Mycologist in the Federated Malay States.

Mr. Bateson, who has recently obtained a first class in the examination for the Associateship of the College, will undergo a further course of three months' training at Kew and the Imperial College before proceeding to take up his duties in the Federated Malay States.

Mr. Frederick G. Spring, of the University of Aberdeen, holder of the University Diploma and National Diploma in Agriculture, has been appointed by the Secretary of State for the

Colonies, on the recommendation of Kew, Assistant to the Director of Agriculture and Superintendent of Government Plantations in the Federated Malay States in the place of Mr. J. W. Campbell (*K.B.*, 1909, 342), resigned.

Botanical Magazine for September.—The plants figured are *Rhododendron Ungernii*, Trautv. (t. 8332); *Chirita rupestris*, Ridl. (t. 8333); *Tristellateia australis*, A. Rich. (t. 8334); *Micromeles caloneura*, Stapf (t. 8335); and *Alectorurus yedoensis*, Makino (t. 8336).

The *Rhododendron* grows at elevations of from 4000 to 6000 feet in the Caucasus, where the more familiar *R. ponticum*, Linn., is also a native. The illustration was prepared from material obtained from a plant which was raised from seed received from the Imperial Botanic Garden, St. Petersburg, in 1886 (not 1866, as recorded in the "Botanical Magazine"). *Chirita rupestris* is a blue-flowered herb belonging to the *Gesneraceae*, and is peculiar as to its habitat, being confined to the limestone rocks of Lankawi, an island off the coast of Kedah in the Malay Peninsula. The Kew plants were raised from seed communicated by Mr. H. N. Ridley, Director of the Singapore Botanic Garden, in 1905. The *Tristellateia* was obtained in 1902 from the same source as the preceding. It is a vigorous climber with yellow flowers, and is included in the *Malpighiaceae*. In distribution it ranges from the Malay Peninsula and Siam, through the Malayan Archipelago to Australasia, the Philippines, and Formosa. *Micromeles caloneura* is a handsome flowering tree or shrub from Western China, allied to the *Aria* section of the genus *Pyrus*. It has been introduced into cultivation by Messrs. J. Veitch & Sons, and flowered for the first time in their Coombe Wood nursery in 1909. *Alectorurus yedoensis* is an elegant hardy plant resembling a *Dianella*, and first described as a species of *Anthericum*. Its home is Japan, whence it has been sent to Mr. A. K. Bulley, of Ness, Neston, Cheshire, who presented to Kew in 1901 the plant which furnished the material for the illustration.

Botanical Magazine for October.—The plants figured are *Betula Maximowiczii*, Regel (t. 8337); *Rosa Moyesii*, Hemsl. et E. H. Wilson (t. 8338); *Styrax Hemsleyanus*, Diels (t. 8339); *Iris Wilsonii*, C. H. Wright (t. 8340); and *Primula Littoniana*, G. Forrest (t. 8341).

The *Betula* is a handsome species with large cordate leaves and has a remarkable resemblance to a *Tilia*. It is a native of Japan, and, according to Professor Sargent, who presented to Kew the seed from which the plants in the Kew collection were raised, it ranges northward through Saghalien into Manchuria. It was first introduced into European gardens by the late Mr. J. H. Veitch, who sent seeds from Yezo to England in 1888. In Japan its timber is used for house-building, and fishermen make torches of the bark which burns readily even when wet. *Rosa Moyesii* will no doubt prove a valuable addition to the already very numerous beautiful garden roses which have reached us from the same

country, China, where, on the mountains of Szechuan, at elevations of from 7000 to 9000 feet, seeds were collected for Messrs. J. Veitch & Sons by Mr. E. H. Wilson. The specimen illustrated was supplied by Messrs. Veitch in September, 1909. This species is allied to *R. macrophylla*, Lindl., and has deep blood-red flowers $1\frac{3}{4}$–$2\frac{1}{2}$ inches across. The *Styrax* comes from Central China, and, as in the case of the rose, and of the *Iris* which is the subject of the succeeding plate, its introducers are Messrs. James Veitch & Sons from whom the specimen figured was received. *S. Hemsleyanus* resembles in habit and flower the Japanese *S. Obassia*, Sieb. & Zucc., differing in several small characters. At Coombe Wood a plant has already reached a height of about 9 feet. *Iris Wilsonii* has affinities with *I. sibirica*, Linn., from which it may be distinguished by its long pedicels, long herbaceous spathes, and mostly yellow flowers. Seeds of this species were collected in Central China. *Primula Littoniana* is one of the many new plants discovered in Western China by Mr. George Forrest when collecting for Messrs. Bees, Ltd. It is a handsome species with many-flowered spikes 3–5 inches long, and is most nearly allied to *P. Vialii*, Delavay, differing chiefly in its larger proportions and in having the calyx-lobes the same length as the tube.

Nandi Rubber.—We have recently received for determination from Mr. D. E. Hutchins, Chief Conservator of Forests, British East Africa, dried specimens of a rubber-plant found in the Nandi forests, British East Africa. The plant proves to be *Landolphia ugandensis*, Stapf, described in the Flora Trop. Africa (Addenda), iv. 1, p. 589, from specimens collected by Mr. M. T. Dawe in Dumu forest, Buddu, Uganda, at 4000 feet. Mr. Hutchins sends us the following information about the plant :—

"This rubber vine is of peculiar interest. It yields a first-rate rubber, exists in considerable quantities in the Nandi forests, and it grows to the size of a Liana or Monkey-rope. It is believed to be the only commercial rubber which can be worked continuously, occurring naturally in an extra-tropical climate. The Nandi forest lying almost immediately under the Equator is at an elevation of between 6000 and 7000 feet ; and has an abundance of mist and cloud tending further to reduce the temperature, which I estimate to be about, on an average, the same as Cape Town. I have recently returned from a visit to the Nandi country, and forward herewith a note on the yield and conditions of growth of this interesting rubber."

Yield.—The present normal production of rubber from the Nandi forest is estimated to amount to 7 tons yearly, worth about £2000 at present Mombasa prices : this is on a basis of only one-third of the vines being tapped for rubber yearly. If it is found that less than two years' rest is sufficient for the vines, the yearly output will rise to 10 or 15 tons, and this again will be doubled if the present proposals for planting the Nandi rubber liana are proceeded with. It is estimated that at present there is an average of 7 lianas per acre with an average diameter of 2 inches and a maximum of 5 inches. The yield per vine tapped is averaged at

1 oz. Last year, when there was indiscriminate tapping in the forest, the total collection amounted to 16 tons. Twenty per cent. of the rubber is lost in smoking and drying. The rubber lianas occur scattered in small patches and strips throughout the wetter side of the forest. On account of this dispersion of the lianas, a man collecting the rubber does not average above 1 lb. a day of raw rubber.

Coagulation.—This has been effected with salt (the salt water being smeared on the surface of the liana), by chewing, and by the use of a fruit termed "Nogute." This fruit is produced in abundance on a small tree or shrub, and both the tree and fruit bear a close resemblance to the well-known Kei apple (*Aberia caffra*) of South Africa.

Noguk or Nōkōk is probably a species of *Flacourtia.*

The acidity of the fruit is about that of good vinegar, and rather less than bottled lime juice. What the acid is has not been determined.

Method of tapping.—The present method is by shaving off slices of bark down to the cambium layer, but it is difficult to prevent these cuts being made too deep, and when they are made too deep, the tissue dies progressively above and below them. Slitting diagonally with a knife seems a better method, and this is now being tried.

The Nandi rubber liana has a fruit in the form of a largish green ball like an orange, in the pulp of which the seed is immersed. The fruit contains so much latex that the rubber from it might pay for the cost of collecting the seed. The fruit is edible, and has a pleasant taste of cucumber. After eating it, bits of rubber are left in the mouth, something like the wax when honeycomb is eaten. In places the lianas show an abundant natural reproduction, and they are said to shoot again readily when cut. Generally, however, there is not much reproduction to be seen, though monkeys eat the fruit and distribute the seed. There seems no difficulty in propagating the Nandi rubber liana from nursery plants in the usual way, and this has now begun.

Nandi Climate.—The climate of the Nandi Plateau, though under the Equator, can only be described as extra-tropical in character. I compute the mean temperature as being between 60° and 61° (Fahr.), while the rainfall is ample for soil fertility, and the mist and clouds sufficient to mitigate excessive solar radiation. Rainfall figures for five years show a mean of about 75 inches. Kàpsàbit, in the centre of the plateau, lies at an elevation of 6300 feet, according to my barometer readings; and this, I understand, tallies with previous observations.

The Nandi Natives are not a numerous tribe. They are estimated not to amount to more than about 30,000. At present they seem more likely to decrease than increase, owing to the rapid spread of disease amongst them. Six years ago they were a warlike tribe with habits like the Masai, and troublesome on account of their raids on the Uganda Railway. They are located in a fine forest, containing much good timber, of which the area is estimated at 150 square miles. They do not practice kumri cultivation, and destroy the forest but little.

The Tomb of William Aiton.—This tomb, in Kew Churchyard, commemorates Mr. William Aiton, who held charge of the Royal Gardens at Kew from 1759 till his death in 1793, and the members of his family. By the courteous permission of the Rev. W. H. Bliss, Vicar of the Parish, the inscriptions on the tomb, which had become so weathered as to be barely legible, have been recut at the expense of a few friends who hold Aiton's memory in high regard. These inscriptions are on three panels of the tomb. The panel nearest the gardens bears the following words :—

THIS MONUMENT IS ERECTED TO THE MEMORY OF
MR. WILLIAM AITON,
LATE GARDENER TO HIS MAJESTY AT KEW,
WHO DIED 2ND FEBRUARY, 1793, AGED 62 YEARS.
ALSO IN THE SAME VAULT ARE INTERRED THE REMAINS OF
ELIZABETH AITON,
WIDOW OF THE DECEASED WILLIAM AITON,
WHO DIED DECEMBER 23RD, 1823, AGED 83 YEARS.
WITHIN THIS TOMB ARE ALSO DEPOSITED THE REMAINS OF
ANNE AUGUSTA TOWNSEND AITON,
YOUNGEST DAUGHTER OF WILLIAM AND ELIZABETH AITON,
SHE DIED AUGUST 1ST, 1828, AGED 46.

The panel on the opposite side of the tomb, facing Kew Bridge, is inscribed as follows :—

BENEATH THIS STONE ARE INTERRED THE REMAINS OF
JANE TOWNSEND AITON,
SECOND DAUGHTER OF THE LATE WILLIAM AND ELIZABETH AITON,
WHO DIED 9TH FEBRUARY, 1831, AGED 61 YEARS.
ALSO THE REMAINS OF
ELIZABETH TOWNSEND AITON,
ELDEST DAUGHTER OF WILLIAM AND ELIZABETH AITON,
SHE DIED 25TH JUNE, 1831, AGED 67 YEARS.
ON 8TH MAY, 1848, DIED SARAH TOWNSEND AITON,
AGED 73 YEARS, THE LAST SURVIVING DAUGHTER OF
WILLIAM AND ELIZABETH AITON—HER REMAINS
ARE ALSO DEPOSITED IN THIS TOMB.

Finally, one of the end panels bears the inscription :—

ALSO TO THE MEMORY OF
MR. WILLIAM TOWNSEND AITON,
OF KEW, ELDEST SON OF WILLIAM AND ELIZABETH AITON,
LATE DIRECTOR-GENERAL OF ALL THE ROYAL GARDENS,
HE DIED OCTOBER 9TH, 1849,
IN THE EIGHTY-FOURTH YEAR OF HIS LIFE.
WITHIN THIS TOMB LIES ALSO THE BODY OF
JOHN TOWNSEND AITON,
LATE DIRECTOR-GENERAL OF THE ROYAL GARDENS,
THE LAST SURVIVOR OF THE DESERVING AND ESTEEMED FAMILY
OF WILLIAM AND ELIZABETH AITON,
DIED JULY 6TH, 1851, AGED 74.

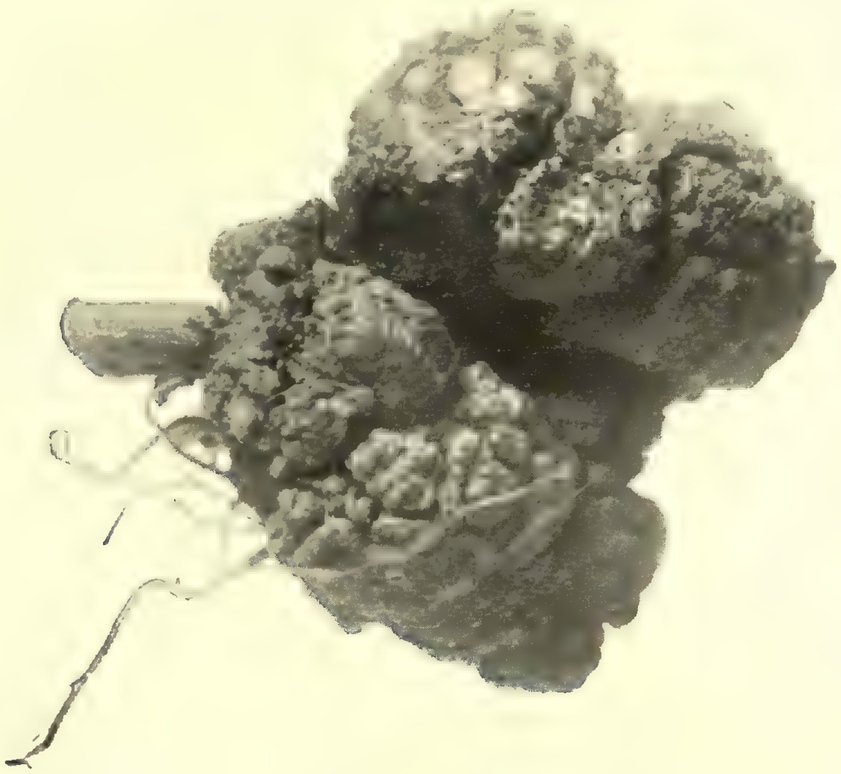
The few known facts of Mr. W. Aiton's biography have been recorded by Sir W. T. Thiselton-Dyer in the *Kew Bulletin* for 1891, p. 298. This account, based on a letter preserved in the Library at Kew, is in substantial accord with that to be found in Anderson's *Scottish Nation* ; the latter account, however, gives Aiton's birth-place as a village near Hamilton, not the town of Hamilton itself. Professor Bayley Balfour, Regius Keeper of the Royal Botanic Garden, Edinburgh, has kindly enlisted the interest of Mr. Henry Paton, of Edinburgh, in this question. Nothing could be found in the records of the parish of Hamilton or in those

of the parish of Cambusnethan, but in the records of the adjoining parish of Avondale there are references in the baptismal roll from 1723 to 1764 to eleven individuals of the name, all natives of Wailsely (the form used from 1723 to 1739) or Wylesly (the spelling adopted from 1741 to 1743) or Wailsly (the form used from 1758 onwards). In the later entries, commencing in 1758, the family name is given as Aitoun; in all those which precede that year the spelling adopted is that consistently employed by the subject of this note, with respect to whom the entry in the roll, dated May 2nd, 1731, is as follows:—"William, son to William Aiton of Wailsely was baptised upon the 28th of April last."

The title page of the *Hortus Kewensis*, like the epitaph on his tomb, describes William Aiton as "Gardener to His Majesty," and there would appear to be no evidence that, officially or otherwise, he ever received any other designation. It will be noted that the portion of the epitaph which relates to William Townsend Aiton describes him as "Director General of all the Royal Gardens." This designation does not, however, as might be supposed, refer exclusively to his connection, as his father's successor, with the Royal Gardens at Kew. In the *Kew Bulletin* for 1891, p. 326, Sir W. T. Thiselton-Dyer has given *in extenso* a minute by the Lord Steward, dated 11th March, 1840; in that minute W. T. Aiton's title, so far as his connection with Kew was concerned, is cited as "Superintendent of the Botanical Gardens." The minute shows that of the various portions, at that date more or less separately treated, which now go to constitute the Royal Botanic Gardens, Kew, the only portion which was not then formally transferred from the control of the Board of Green Cloth to the control of the Commissioners of Woods and Forests was the 'Kitchen Garden,' now the 'Herbaceous Ground.' From that time therefore W. T. Aiton's Superintendentship, under the Board of Green Cloth, may have been confined to the Kitchen Garden, though it would appear (*Kew Bulletin* for 1891, p. 327) that, subsequent to the transfer in question and after his resignation of the Superintendentship of the 'Botanical Gardens' proper, then only 15 acres in extent, of which Sir W. J. Hooker became the Director on 1st April, 1841, W. T. Aiton remained for some five years in charge of the portion designated the 'Pleasure Ground.' In 1843, however, 48 acres of the 'Pleasure Ground' were devoted to purely botanical purposes, and in 1846 the Royal Kitchen Garden was abolished and the ground thus occupied was added to the Botanical Garden (*Official Guide*, p. 11). When the title 'Superintendent' was first recognised by the Board of Green Cloth is not clear; in 1810, on the title page of the second edition of the *Hortus Kewensis*, W. T. Aiton is termed 'Gardener to His Majesty' as his father had been in the previous edition. On the other hand W. T. Aiton's administrative charge was not confined to the various portions of what now constitutes the Royal Botanic Gardens, Kew. The extent of this charge is not clear but we learn from a letter, written at Kew either towards the end of 1804 or in the beginning of 1805 by Mr. W. McNab, that "Mr. Aiton " . . . . has had an addition to his charge by the death of "Mr. Forsyth, late of Kensington, who died in August, 1804,

"when His Majesty was pleased to appoint Mr. Aiton gardener "there likewise" (*History of the Royal Botanic Gardens, Edinburgh*, p. 302). The letter continues, "and Mr. John Aiton "has the whole of Windsor Gardens to himself." Whether this means that till the change above referred to took place Mr. John Townsend Aiton held charge at Windsor as his brother's subordinate but was from this time placed in independent charge there is not clear. But whatever the truth as to this may be it is evident that W. T. Aiton did hold charge of Royal Gardens other than those at Kew and it is probable that the designation employed in his epitaph had reference to this fact. That the designation was in use and that it was understood may be gathered from the Report submitted to the Treasury in 1838 by Dr. J. Lindley, in which there is a specific reference to the exercise by W. T. Aiton of his power as Director-general (*Kew Bulletin* for 1891, p. 321).

The epitaph makes a distinction between the designation 'Director-general of all the Royal Gardens' applied to W. T. Aiton, and that of 'Director-general of the Royal Gardens' applied to his younger brother John Townsend Aiton. We have seen that after 1804 J. T. Aiton had charge of the Royal Gardens at Windsor. But it appears that at a later date he lived at Kensington Palace; he wrote letters dated from there between 1841 and 1845. He seems indeed to have had charge of the Kensington Palace Gardens in 1841, though whether independently or as the subordinate of his brother, W. T. Aiton, is not clear, for he wrote thence on 21st September, 1841, informing Sir W. J. Hooker of the despatch to him of certain fruit trees. After the death of W. T. Aiton in 1849, J. T. Aiton resided in the house which his brother had occupied. But, at the time of his own death, which took place in 1851, no portion of what now constitutes the Royal Botanic Gardens, Kew, was included in the Director-generalship alluded to in J. T. Aiton's epitaph.



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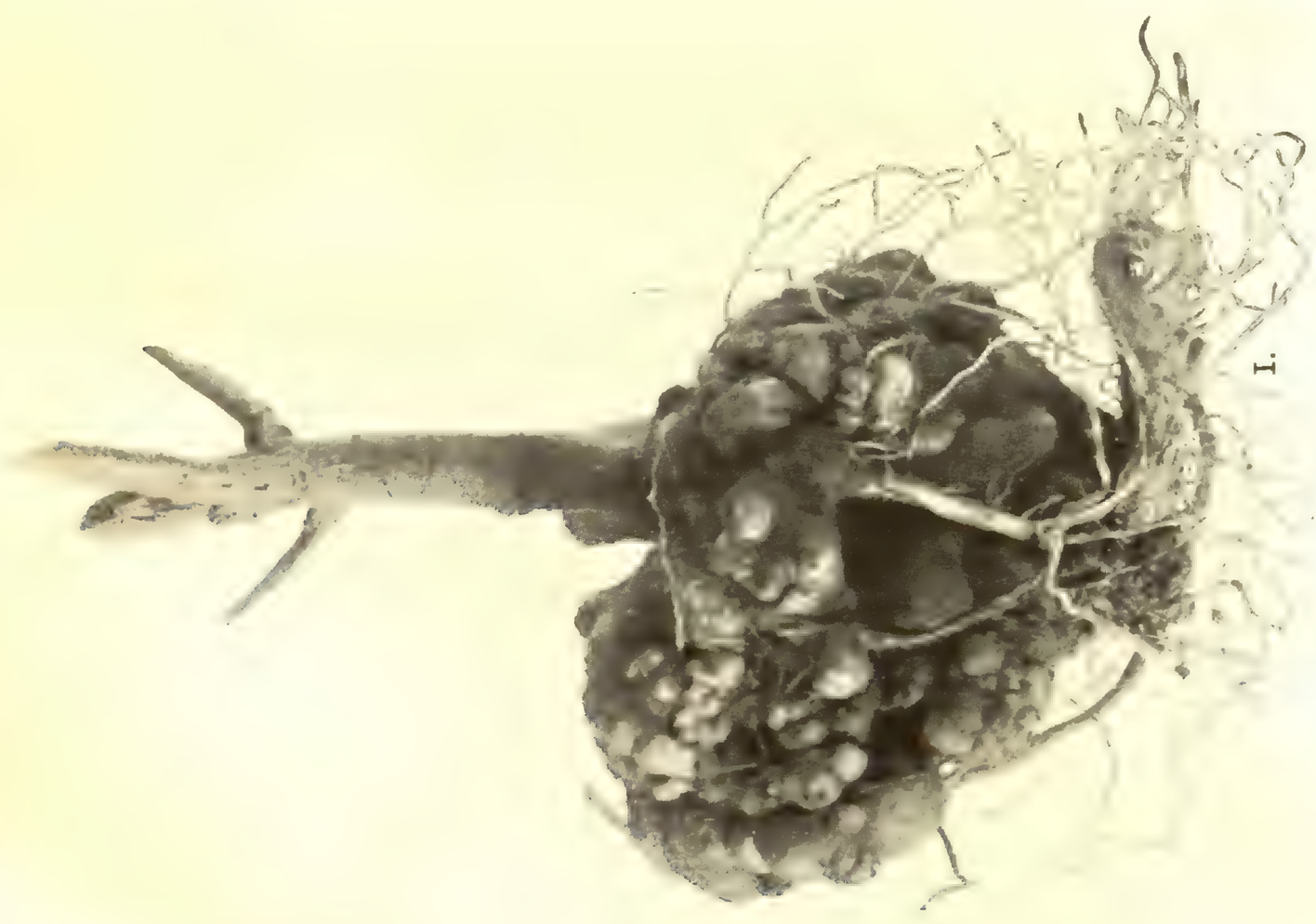

I.

CROWN GALL.

To face page 309.]

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] [1910.

XLVI.—CROWN-GALL.

(*Dendrophagus globosus*, Toumey.)

G. Massee.

(With Plate.)

The presence of galls or tumours on the roots of plants of various kinds has frequently been recorded both in this country and on the Continent, more especially on vine roots. These outgrowths have been investigated from time to time, and various organisms, such as fungi, myxogastres, bacteria, have been observed in the tissues, but in no instance has the pathogenesis of any of these organisms been clearly demonstrated. The generally accepted opinion has been that the primary cause of such galls is due to wounds, frost, or to some other physiological disturbance.

During the past season, examples of plum, rose, raspberry, loganberry, and chrysanthemum plants have been received at Kew for investigation, each bearing irregularly globose, nodulose swellings, originating from the collar region of the stem. In the raspberry small nodules were also present on the branches of the root. Most of the galls were woody and dead, and showed no indication of the cause of their origin. Mycelium and spores of various fungi were met with in the broken-down tissues, but nothing that suggested, from analogy, any organism capable of inducing the formation of a gall. It was not until specimens of the Paris daisy (*Chrysanthemum frutescens*, L.), bearing large excrescences at the base of the stem, were examined, that the true nature of the gall was determined. This proved to be the well-known and very destructive disease called "Crown-gall." Such galls are believed to be caused by *Dendrophagus globosus*, Toumey, one of the Myxogastres or Mycetozoa, allied to *Plasmodiophora brassicae*, Woronin, the cause of "finger-and-toe" or "anbury" on the roots of many cruciferous plants.

When a section of a gall in a soft and succulent condition is examined under the microscope, strands of plasmodium are seen permeating the tissues in every direction. In certain cells the plasmodium appears as a reticulated vacuolate mass, and is often rather coarsely granular. When treated with Flemming's solution,

(17883—6a.) Wt. 92—428. 1375. 12/10. D & S.

or with 1 per cent. osmic acid, the plasmodium gradually blackens, and in a rather thick section the distribution of the parasite in the tissue can be readily seen. A similar effect, although not so strongly emphasised, is produced when a section is treated with a solution of iodine. It is somewhat remarkable that during the active or vegetative period of the plasmodium there is not a trace of starch present in the tissues of the gall. In connection with this, and perhaps as an explanation, Toumey remarks that repeated tests show that the gall tissue contains a much larger quantity of an oxidizing enzyme than the normal tissue. Toumey, who first discovered *Dendrophagus*, has given a detailed account of its development, accompanied by figures, and among other points states that when a section of a gall containing plasmodium is placed under proper conditions, amoeboid bodies separate from the plasmodium in the course of two or three days.

In the English specimens I observed that if a gall containing plasmodium is cut off and allowed to become dry, the plasmodium concentrates into compact masses and appears to pass into a resting condition. If sections are now cut and placed in slightly warm water, the resting masses of plasmodium gradually expand and assume the motile or streaming state. Eventually the plasmodium concentrates in the peripheral cells of the gall and from thence passes to its free surface, where it becomes resolved into numerous minute, globose sporangia of a reddish-yellow colour and about 1 mm. diameter. The sporangia contain numerous minute orange-yellow spores, 1·5 to 3 μ in diameter. Traces of a capillitium are also present, mixed with the spores. Toumey has obtained the fruit on several occasions on galls from different districts.

Crown-gall is considered a very serious disease in the United States. Many thousands of fruit trees have been killed by it when growing under the most favourable conditions. The subject has been very carefully worked out by Toumey, who has met with the galls on the following trees : peach, apricot, almond, prune, plum, apple, cherry, poplar, chestnut, raspberry, and blackberry. He has proved that the disease is of a contagious nature. Healthy seedlings planted in soil mixed with sliced galls contracted the disease, as did also healthy trees planted in proximity to diseased ones.

In addition to the above experiments, which, although strongly suggestive of the myxogaster being the primary cause of the gall formation, do not absolutely prove the point, Toumey made inoculations at the crown of one-year-old almond seedlings, using spores of *Dendrophagus*, and in due course galls developed at the point of inoculation.

Seedlings are most susceptible to the disease. The galls appear in the region of the collar or on the larger roots and commence growth as very minute, smooth, colourless, wart-like bodies, often attached to the stem by a narrow neck. Growth is rapid, and the surface of the gall soon becomes nodulose or warted, and darkens in colour. The galls usually decay at the end of one season's growth, and leave an open wound which penetrates for some distance into the wood. The following season gall formation commences round the margin of the wound formed the previous season. These galls

perish in turn, and the process is repeated each season, resulting in a large, deep wound. When two or three such wounds are present on different sides of the stem, its stability is much diminished, and it frequently breaks at the injured part.

We have at present no direct knowledge as to the relative frequency of crown-gall in this country. The galls are usually formed just under ground, or on the root, and so escape observation, and those galls that have been noted from time to time have had their origin attributed to other than the true cause. Judging from the literature pertaining to plant diseases, galls answering to the description of crown-gall, are by no means uncommon in every country where fruit trees are grown.

According to Toumey, crown-gall is most destructive to nursery stock, as the disease spreads rapidly along the rows, killing a large number of seedlings outright. The widespread dissemination of the disease in the United States is attributed to the wholesale distribution of infected stock from nurseries, also to negligence in the disposal of diseased material. When older trees become infected the galls may continue to be produced for many years, the tree living on, but making less growth and producing a smaller quantity of fruit, and of an inferior quality to that of a healthy tree. Under such circumstances it is false economy to allow such a tree to remain standing.

It is estimated that $1,000,000, possibly much more, is lost annually in the fruit-growing districts of the United States through this disease.

When trees are not badly diseased, Toumey found that by cutting away the galls, and covering the wounds with a paste composed of two parts sulphate of copper, one part sulphate of iron, and three parts of quick-lime, the further development of the galls was arrested. On the other hand, it is considered that in the end the most economical course is to remove and burn all trees that are at all badly infected, as such constitute centres of infection from which the disease spreads to neighbouring trees; such trees, although they may continue to live and bear a certain amount of fruit for many years, should not be allowed to monopolise the space that could be more profitably occupied by a healthy tree.

Quick-lime should be worked into the soil in orchards known to be infected. Finally, nursery stock should be critically examined before it is planted.

Following on Toumey's investigations, Erwin F. Smith and E. O. Townsend have devoted a considerable amount of time and attention to the origin and cause of crown-gall, and have come to the conclusion that a bacterium is the primary cause of these outgrowths, and furthermore that *Bacterium tumefaciens*, the cause of the mischief, is a new species. According to these authorities Toumey's myxogaster is a secondary agent. One thing seems fairly certain, the galls investigated by the different authors mentioned are identical in origin. It is further certain that crown-gall, as met with in England, has exhibited Toumey's *Dendrophagus*, whereas no trace has yet been found of *Bacillus tumefaciens*, as described by Smith and Townsend, in "Centralbl. f. Bakt. Parasit. u. Infektionskr," 20, p. 89 (1907).

From an economic standpoint the fact that crown-gall is due to a living organism enables a definite scheme for its prevention to be formulated, and the fact of its being contagious—which is admitted by all who have investigated the subject—should lead to measures for the prevention of its wholesale dispersion, on the part of both nurserymen and fruit growers.

Explanation of Plate.

1.—Crown-gall in fresh condition on the root of *Chrysanthemum frutescens*, L., the Paris daisy.
2.—An exolete or woody condition of crown-gall on the root of a cultivated rose tree. Both figures half natural size.

XLVII.—NEW LAURACEAE FROM THE MALAYAN REGION: III.

J. S. Gamble.

Actinodaphne montana, *Gamble* [Lauraceae-Litseeae]; species *A. angustifoliae*, Nees, affinis et forsitan ejus varietas sed folia nervis supra haud prominentibus et perianthii tubus fructifer multo longior.

Arbor ad 15–20 m. alta et 30–45 cm. trunci diametro; ramuli fusci, glabri, striati; perulae ovatae, acuminatae, apicibus recurvis. *Folia* chartacea, 4–5 in verticillis ad nodos, incrassata, lanceolata vel oblanceolata, apice longe acuminata, basi acuminata, utrinque glabra et infra siccitate glauca; 15–25 cm. longa, 4–8 cm. lata; costa prominens; nervi utrinque 8–10 obliqui, marginem versus curvati et ibi gradatim arcuati; nervuli transversi conspicui, arcuati, reticulatione conspicua; petiolus gracilis, 1–3 cm. longus, sulcatus. *Flores* ignoti, in umbellulis in racemis pubescentibus 2 cm. longis ex internodiis verticillorum. *Drupa* (immatura) in perianthii tubo incrassato cyathiformi pedicello aequilongo insidens; matura nondum visa.

Malay Peninsula. Perak: mountain tops near Larut, 900–1100 m., *King's Collector*, 2129, 2913.

Actinodaphne Ridleyi, *Gamble* [Lauraceae - Litseeae]; species *A. malaccensi*, Hook. f., affinis, foliis angustioribus nervis paucioribus, floribus minus congestis et perianthii lobis longioribus differt.

Arbor ?; ramuli teretes, juniores ferrugineo-pubescentes. *Folia* chartaceo-coriacea, 4–6 in verticillis, lanceolata, apice acuminata et mucronata, basi acuminata; supra lucida, glabra, areolata, infra fusco-villosa, ad costam et nervos pubescentia, marginibus paullo recurvis; 10–16 cm. longa, 3–5 cm. lata; costa gracilis, utrinque prominens; nervi utrinque 6–8, ad marginem curvati et ibi gradatim minus arcuati; nervuli transversi recti, sicut reticulatio obscuri; petiolus mediocre crassus, ferrugineo-pubescens, 1–2 cm. longus. *Flores* in umbellulis sessilibus axillaribus vel lateralibus perulis paleaceis deciduis suffultis; bracteae involucrales orbiculares, deciduae; flores in umbellulis circa 4; perianthii tubus 2·5 mm.

longus, lobi obovati, obtusi, 3·5 mm. longi, extus dense villosi, intus glabri. *Stamina* florum ♂ ignota ; staminodia florum ♀ 9, ordinum I et II lineari-clavata, 1·5 mm. longa, filamentis villosis, ordinis III similia, glandulis 2 magnis glabris subreniformibus paullo supra basin filamenti. *Ovarium* obovoideum, apice hirsutum, stylo gracili curvato, stigmate parvo trilobo. *Drupa* globosa, 1 cm. diametro, supra perianthii tubum incrassatum lobis et staminodiis persistentibus insidens ; pericarpium glabrum, lucidum.

Malay Peninsula. Johor : at Gunong Pulai, *Ridley*, 12,165.
Borneo. *Haviland.*

Actinodaphne johorensis, *Gamble* [Lauraceae-Litseeae] ; species *A. malaccensi*, Hook. f., affinis, foliis lanceolatis angustioribus coriaceis infra glaucis, nervis paucioribus, etiam drupa et perianthii tubo incrassato majoribus differt.

Arbor ? ; ramuli teretes, glabri, juniores paullo rufo-villosi. *Folia* coriacea, 3–5 in verticillis, anguste lanceolata, apice obtusa, basi longe cuneata, utrinque glabra, supra lucida, siccitate olivaceo-viridia, infra glauco-grisea ; 12–16 cm. longa, 3–5 cm. lata ; costa gracilis utrinque prominens ; nervi distantes, utrinque 6–7, obliqui, prope marginem arcuatim inter se juncti ; nervi secundarii pauci ; nervuli transversi cum reticulatione areolata perobscuri ; petiolus 2–3 cm. longus, sulcatus. *Flores* haud noti, in umbellulis ut videtur ad verticillorum internodia. *Drupa* globosa, 1·2 cm. diametro, supra perianthii tubum incrassatum complanatum 7 mm. diametro insidens, pedicello crasso 8 mm. longo ; pericarpium opacum, siccitate nigrum.

Malay Peninsula. Johor : at Gunong Panti, 300 m., *Ridley*, 4419.

Actinodaphne oleifolia, *Gamble* [Lauraceae-Litseeae] ; species *A. stenophyllae*, Thwaites, insulae zeylanicae incolae peraffinis, foliis infra glabris nec ad nervos ferrugineo-pubescentibus, pedunculis brevioribus et perianthii lobis persistentibus differt.

Arbor parva vel frutex vix 2–3 m. alta ; ramuli graciles, teretes, pallide griseo-fulvi, juniores molliter ferrugineo-villosi sicut etiam inflorescentia. *Folia* coriacea, 4–8 in verticillis, elliptico-oblonga vel lanceolata, apice obtusa, basi breviter attenuata, glabra, supra lucida, infra glauca ; 5–11 cm. longa, 2–3 cm. lata ; costa crassa rufescens ; nervi utrinque 8–10 vel plures, supra prominentes, ad marginem curvati ; nervuli transversi arcuati ; reticulatio prominenter areolata ; petiolus ruber, gracilis, 1–2 cm. longus. *Flores* in umbellularum fasciculis densis cymosis ex verticillorum axillis vel ex internodiis ; bracteae orbiculares, deciduae ; flores in umbellulis 5; bracteae involucrales 5–6, concavae, imbricatae; perianthii lobi ovati, extus dense villosi, intus glabri, 3 interiores paullo minores, 2–3 mm. longi. *Stamina* florum ♂ filamentis villosis, ordinum I et II brevia, ordinis III glandulis 2 reniformibus sessilibus ; staminodia florum ♀ villosa, ordinum I et II spathulata, ordinis III bastata glandulis 2 magnis glabris munita. *Ovarium* in floribus ♂ rudimentarium, stylo gracili, stigmate capitato ; in floribus ♀ ignotum. *Drupa* ovoideo-oblongo, 7–12 mm. longa, 4–7 mm. lata, supra peranthii tubum incrassatum cupuliformem et lobos persistentes

insidens ; pedicelli 5 mm. longi, villosi ; pericarpium laeve, stylo persistente.

Malay Peninsula. Perak: at Gunong Batu Pateh, 1470 m., *Wray*, 280 ; at Gunong Iras, 1500 m. *Wray*, 4111 ; in open forest, 1500–1600 m., *King's Collector*, 7347 ; at 1500 m., *Scortechini*, 350. Pahang : at Gunong Berimbu, *Ridley*, 13,728 ; at Kluang Terbang, *W. D. Barnes*.

Borneo. Sarawak : near Kuching, *Haviland and Hose*, 364 (folia longiora et minus prominenter areolata).

Actinodaphne Hullettii, *Gamble* [Lauraceae-Litseeae] ; species *A. oleifoliae*, Gamble, affinis, foliis acuminatis infra molliter griseo-fulvo-pubescentibus vel glaucis et reticulatione obscura differt.

Arbor ; ramuli graciles griseo-fulvi, juniores ferrugineo-pubescentes. *Folia* coriacea, 3–5 in verticillis, oblanceolata, apice acuminata, basi cuneata ; supra lucida, praeter costam glabra, infra molliter griseo-fulvo-pubescentia ; 7–11 cm. longa, 2–3 cm. lata ; costa gracilis prominens, ferrugineo-pubescens ; nervi utrinque 5–6, perobliqui, ramosi ; nervuli transversi pauci, in foliis vetustioribus solum visibiles ; reticulatio etiam haud visibilis ; petiolus 0·5–1 cm. longus, ferrugineo-pubescens. *Flores* in umbellularum fasciculis bracteatis axillaribus vel lateralibus ; bracteae deciduae ; pedunculus brevis crassissimus ; ♂ cum pedicellis 2–3 mm. longis ; perianthii tubus brevis, villosus, lobi ovati, ciliati, extus pubescentes, intus glabri, 2·5 mm. longi. *Stamina* florum ♂ filamentis villosis, ordinum I et II breviter oblonga, ordinis III breviora, glandulis 2 magnis reniformibus prope basin. *Ovarium* florum ♂ rudimentarium, ovoideum, stylo brevi. *Drupa* cum florum ♀ staminodiis et ovario ignota.

Malay Peninsula. Singapore : in Botanic Garden (wild ?), *Hullett*, 659.

Actinodaphne cuspidata, *Gamble* [Lauraceae-Litseeae] ; species *A. borneensi*, Meissn., affinis, foliis cuspidatis nervis pluribus differt.

Arbor ad 12–18 m. alta et 20–30 cm. trunci diametro ; ramuli crassiores, cortice griseo vel flavescenti, juniores ferrugineo-pubescentes. *Folia* subcoriacea, circa 4 in verticillis, elliptica vel elliptico-obovata, apice longe cuspidato-acuminata acumine acutissimo, basi attenuata ; supra glabra lucida, subtus glauca, pilis sparsis nigris munita, ad costam et nervos ferrugineo-pubescentia ; 8–12 cm. longa, 4–5 cm. lata ; costa conspicua, prominens ; nervi utrinque 8–10, irregulares, curvati et ad marginem arcuatim juncti ; nervuli transversi sub-horizontales, reticulatione obscura ; petiolus gracilis ferrugineo-pubescens, 1 cm. longus. *Flores* in umbellulis in racemis brevissimis ferrugineo-pubescentibus vix 1 cm. longis subterminalibus vel lateralibus ex verticillorum internodiis, basi perulis castaneis caducis suffultis ; pedunculi brevissimi ; bracteae involucrales 4, ovatae ; flores in umbellulis 4 ; perianthii lobi ovati, obtusi, ciliati, 2·5 mm. longi. *Stamina* florum ♂ 9, ordinum I et II 2 mm. longa, antheris oblongis et filamentis villosis ; ordinis III breviora glandulis 2 magnis sessilibus vel brevissime stipitatis ad basin ; florum ♀ staminodia ignota. *Ovarium* florum ♀ ignotus, florum ♂ rudimentarium stylo gracili, stigmate capitato. *Drupa* non visa.

Malay Peninsula. Perak: on hills near Ulu Bera, 150–250 m., *King's Collector*, 10,797.

Actinodaphne fragilis, *Gamble* [Lauraceae - Litseeae]; species pulchra caeteris haud affinis, foliis ovatis subtus albis et inflorescentiae ramulis fragilibus insignis.

Arbor ad 12–18 m. alta et 60 cm. trunci diametro; ramuli graciles griseo-fulvi glabri, juniores minute puberuli. *Folia* coriacea, 2–4 in verticillis, ovata vel elliptico-ovata, apice obtuse acuta, utrinque glabra, infra albo-glauca; 5–12 cm. longa, 2–5 cm. lata; costa gracilis, utrinque prominens; nervi utrinsecus 5–6, pare infimo subopposito, ad marginem curvati et ibi arcuati; nervuli transversi et reticulatio areolata obscuri; petiolus gracilis, 1–2 cm. longus, sulcatus. *Flores* in umbellulis, in umbellis gracilibus ferrugineo-pubescentibus pedunculatis ad 1 cm. longis, lateralibus in internodiis ramulorum ultimorum, siccitate fragilibus; bracteae involucrales cito deciduae; pedicelli graciles, 2 mm. longi; perianthii tubus brevis, annulo pilorum aureo-fulvorum intus ad os munitus; lobi ovati, ciliati, intus glabri, 1 mm. longi. *Stamina* florum ♂ ignota; florum ♀ staminodia minima, clavata, filamentis villosis, ordinis III glandulis 2 glabris orbicularibus. *Ovarium* globosum, stylo gracili torto stigmate magno capitato. *Drupa* ovoidea, ad 1·cm. longa, 7–8 mm. diametro, supra perianthii tubum incrassatum patelliformem 5–6 mm. diametro insidens; pericarpium laeve, lucidum, pedicello incrassato 7 mm. longo.

Malay Peninsula. Perak: Ulu Bubong; on top of hills, 180–280 m., *King's Collector*, 10,743, 10,904.

Litsea johorensis, *Gamble* [Lauraceae-Litseeae]; species cauliflora, *L. cauliflorae*, Stapf, borneensi affinis, foliorum nervatione et umbellulis majoribus praecipue differt.

Arbor parva, cortice albo; ramuli graciles, grisei, juniores dense rufo-tomentosi. *Folia* coriacea, alterna, ad apices ramulorum paullo conferta, oblanceolata, apice acuminata, basi longe attenuata, supra fusca, costa et nervis exceptis glabra, infra parce tomentosa, purpurea, juniora rufo-purpurea; 10–30 cm. longa, 4–10 cm. lata; costa gracilis, supra impressa; nervi utrinque 10–14, supra impressi, marginem versus cito curvati; nervuli transversi irregulares, ramosi, reticulatione areolata; petiolus ex basi crasso gracilis, supra sulcatus, 1·5–2·5 cm. longus. *Flores* in umbellulis, pedunculis tomentosis 1·5 cm. longis, ex tuberculis lignosis e trunco arboris; umbellulae florum ♂ ad 1·5 cm. ♀ ad 1 cm. diametro; bracteae involucrales 4–5, orbiculares, extus tomentosae, intus glabrae; flores in umbellulis subsessiles; perianthii lobi oblongi vel spathulati, parce villosi, 5–7 mm. longi. *Stamina* florum ♂ recte 9, saepe 10, ordinum I et II ad 9 mm. longa; antheris oblongis et filamentis villosis, aliquando 1–2 glandulas parvas ferentibus; ordinis III breviora, glandulis 2 magnis reniformibus, stipitatis, filamentorum ad basin thecis magnis ellipticis; ovarium rudimentarium ovoideum, stylo crasso stigmate bifido. *Staminodia* florum ♀ recte 9, saepe ad 12, ordinum I et II linearia, villosa, ad 3 mm. longa, saepe glandulas ferentia; ordinum III et IV triangulari-acuminata, glandulis 2 magnis, 1 mm. longa. *Ovarium* ovoideum, glabrum, stylo crasso curvato; stigmate peltato. *Drupa*

(immatura) ovoidea, apice truncata, ad dimidium in perianthii tubo incrassato 6 mm. longo 1 cm. diametro inclusa ; pedicellus incrassatus, brevissimus, crassus ; pericarpium laeve.

Malay Peninsula. Johor : at Tanjong Bunga, *Ridley*, 6458 ; near Castlewood, *Ridley*, 9163 ; at Mount Austen, *Ridley*, 11,995 , at Seduah, *Ridley*, 13,479.

Litsea trunciflora, *Gamble* [Lauraceae-Litseeae] ; species cauliflora, sicut *L. cauliflora*, Stapf, et *L. johorensis*, Gamble, sed foliis majoribus differt ; etiam *Tetrantherae* ? *ochrascenti*, Miquel, e Sumatra (cujus flores ignoti) affinis sed foliorum nervatione differt.

Arbor ad 18 m. alta et 30–40 cm. trunci diametro, cortice laevi griseo-fulvo ; ramuli crassi pallide fusci, juniores ferrugineo-tomentosi. *Folia* chartacea, alterna, obovata vel oblanceolata, apice rotundata vel emarginata, basi longe cuneata, supra lucida praeter costam villosa, infra caerulescentia, siccitate griseo-fusca, ferrugineo-tomentosa ; 28–56 cm. longa, 11–22 cm. lata ; costa crassissima, supra impressa ; nervi utrinque 11–22, supra impressi, saepe ramosi et cum nervis etiam secundariis primo recti, prope marginem curvati et arcuati ; nervuli transversi distantes, irregulares ; reticulatio areolata ; petiolus crassissimus, 1·5–2·5 cm. longus. *Flores* in umbellulis pedunculis pubescentibus 1–1·5 cm. (♂) 7–8 mm. (♀) longis, ex tuberculis lignosis e trunco arboris ; fasciculi multiflori, circa 5 cm. diametro ; umbellulae 1–1·2 cm. diametro ; bracteae involucrales 4, orbiculares, extra pubescentes, intus glabrae ; flores in umbellulis ♂ 4–5, sessiles ; perianthii lobi 6, variabiles, saepe lineari-oblongi, sparse villosi, 5–6 mm. longi. *Stamina* florum ♂ numero variabilia, recte 9 vel 12 ; ordinum I et II 7–8 mm. longa, antheris oblongis et filamentis villosis saepe glandulas ferentibus ; ordinum III et IV breviora, glandulis 2 rotundis stipitatis filamentorum ad basin thecis magnis ellipticis saepe lateralibus ; ovarium rudimentarium ovoideum, stylo gracili curvato, stigmate peltato. *Staminodia* florum ♀ ordinum I et II lineari-clavata, 3 mm. longa, villosa, saepissime glandulas ferentia, ordinum III et IV breviora, glandulis 2 crassis. *Ovarium* ovoideum, stylo gracili recto ; stigmate peltato. *Drupa* (immatura) depresso-globosa, in perianthii tubo incrassato fere omnino inclusa.

Malay Peninsula. Perak : Goping District, 150–300 m. *King's Collector*, 4582, 8211 ; without locality, *Herb. Singap.*, 448.

Litsea artocarpifolia, *Gamble* [Lauraceae-Litseeae] ; species *L. grandi*, Hook. f., affinis, racemis longioribus, umbellulis subsessilibus foliis griseis costa complanata et aliis notis differt.

Arbor ; ramuli crassissimi, lenticellis et foliorum delapsorum cicatricibus multis notati, fusci, juniores ferrugineo-pubescentes. *Folia* coriacea, alterna, obovata, apice obtusa vel paullo apiculata, basi attenuata, supra lucida, praeter costam et nervos glabrescentia, infra ferrugineo-pubescentia ; 20–25 cm. longa, 9–12 cm. lata ; costa crassa, latissima, supra depressa ; nervi utrinque circa 20, regulares, paralleli, impressi, primo recti deinde curvati ; nervuli transversi multi, prominentes ; reticulatio obscura ; petiolus crassissimus, 1–1·5 cm. longus, supra sulcatus. *Flores* in umbellulis sessilibus vel brevipedunculatis, in racemis 4–6 cm. longis ex foliorum delapsorum axillis confertis ; umbellulae ♂ 1·5 cm. latae, bracteae involucrales 5, orbiculares, concavae ; flores in umbellulis 6 ; pedicelli crassi, villosi,

4 mm. longi; perianthii lobi 6–8 oblongo-lanceolati, sericeo-villosi, 5 mm. longi. *Stamina* florum ♂ 9–15, probabiliter recte 12; ordinum I et II 8 mm. longa, aliquando glandulas ferentia; ordinum III et IV breviora, glandulis 2 magnis reniformibus stipitatis paullo supra filamentorum basin; antherae obovatae thecis inferioribus lateralibus; ovarium rudimentarium 0. *Staminodia* florum ♀ et drupa ignota.

Malay Peninsula. Perak: at Relan Tujor, *Wray*, 2233.

Litsea gracilis, *Gamble* [Lauraceae-Litseeae]; species gracilis *L. rangoonensi*, Meissn., affinis, foliis subtus haud ferrugineo-tomentosis nervis foliorum paucioribus et floribus in fasciculis perpaucis differt.

Arbor parva; ramuli gracillimi, dense ferrugineo-pubescentes. *Folia* membranacea, alterna, oblongo-lanceolata, apice acuminata, basi attentuate acuta, supra lucida, praeter costam glabra, infra sparse villosa; 8–14 cm. longa, 2–4 cm. lata; costa gracilis supra parum impressa; nervi utrinque 8–10, e costa curvati et prope marginem gradatim arcuati; nervuli transversi irregulares ramosi; reticulatio obscura; petiolus gracilis, 4–5 mm. longus. *Flores* in umbellulis parvis brevissime pedunculatis per 2–3 in axillis foliorum ultimorum confertis; umbellulae florum ♂ 4 mm. diametro; bracteae involucrales 4, ovatae, membranaceae, extus villosae intus glabrae; flores in umbellulis 3; pedicelli minuti; perianthii lobi obovati, 1–1·5 mm. longi ♂, sub 1 mm. ♀, extra villosi. *Stamina* florum ♂ 9, exserta; ordinum I et II 2 mm. longa, antheris parvis obovatis et filamentis longe pilosis; ordinis III similia, glandulis 2 globosis subsessilibus prope basin filamentorum; ovarii rudimentum 0. *Staminodia* florum ♀ 9, minuta; ordinum I et II clavata, filamentis pilosis; ordinis III subulata, glandulis 2 globosis prope basin. *Ovarium* globosum, stylo crasso curvato, stigmate peltato. *Drupa* (immatura) obovoidea, apiculata, perianthii tubo incrassato, lobis et staminodiis persistentibus suffulta.

Malay Peninsula. Perak: at Temango, *Ridley*, 14,603.

Litsea Ridleyi, *Gamble* [Lauraceae-Litseeae]; species *L. Wallichii*, Hook. f., affinis, differt foliis puberulis et haud prominenter areolatis.

Arbor; ramuli modice crassi, fulvi, juniores minute ferrugineo-pubescentes. *Folia* chartacea, alterna; elliptico-oblonga vel lanceolata, apice obtusa vel acuta et saepe mucronata, basi longe attenuata, supra lucida, costa excepta glabra, infra subglauca puberula; 10–25 cm. longa, 4–8 cm. lata; costa gracilis, supra vix prominens; nervi utrinque 7–10, saepe irregulares vel ramosi, supra impressi, marginem versus curvati, 2 superiores ad acumen; nervuli transversi irregulares; reticulatio minute areolata; petiolus crassus, supra complanatus, rugosus, nigrescens, 1·5–2·5 cm. longus. *Flores* in umbellulis brevibus pedunculatis in racemis brevissimis axillaribus vel lateralibus ferrugineo-villosis 5 mm. longis; umbellulae apertae 0·8–1 cm. latae; bracteae involucrales 4, ovato-oblongae, 4 mm. longae; flores in umbellulis 4–6; perianthii tubus brevis, lobi oblongi, villosi, 2–3 mm. longi. *Stamina* florum ♂ plerumque 9, ordinum I et II 3 mm. longa, antheris subquadratis et filamentis gracilibus villosis; ordinis III breviora, glandulis 2

subsessilibus paullo supra basin filamentorum; ovarium rudimentarium conicum, stylo gracili, stigmate bifido. *Staminodia* florum ♀ 9–12, ordinum I et II clavata, filamentis villosis 1–2 mm. longis, ordinum III et IV breviora glandulis 2 magnis paullo supra basin filamentorum. *Ovarium* ovoideum, glabrum, stylo curvato, stigmate subcapitato bifido. *Drupa* globosa, 1·5 cm. diametro, supra perianthii tubum incrassatum primo fere clausum deinde obconicum rugosum 6 mm. altum 0·8–1 cm. diametro ore crenulatum et lobis et staminodiis persistentibus munitum insidens; pedicellus paullo incrasatus; pericarpium laeve, lucidum, siccitate rugatum.

Malay Peninsula. Singapore: Changi, *Ridley*, 3803; at Reservoir road, *Ridley*, 5101; at Bukit Mandai, *Ridley*, 3836, 4701, 5064, 10,833; at Holland road, *Hullett*.

Litsea quercina, *Gamble* [Lauraceae-Litseeae]; species *L. castaneae*, Hook. f., affinis, foliis magis coriaceis minoribus nervis paucioribus differt.

Arbor; ramuli griseo-brunnei, graciles, juniores griseo-pubescentes sicut innovationes et petioli et foliorum costa. *Folia* coriacea, alterna, elliptica vel elliptico-ovata, apice obtusa et mucronata, aliquando emarginata, basi rotundata; utrinque grisco-brunnea, supra lucida, nervis exceptis glabra, infra minute puberula; 6–8 cm. longa, 3–5·5 cm. lata; costa pubescens, profunde impressa; nervi utrinsecus 7–9, supra impressi, ad marginem curvati; nervuli transversi obscuri; reticulatio areolata, utrinque sub lente conspicua; petiolus 0·8–1 cm. longus, gracilis. *Flores* in umbellulis, pedunculis 6–8 mm. longis muniti, in racemis brevissimis lateralibus. *Drupa* ellipsoideo-oblonga, 2 cm. longa, 1 cm. diametro, supra perianthium incrassatum cupuliforme insidens; cupula siccitate nigra, 7 mm. alta, 9 mm. diametro, ore rotundo; pedicellus incrassatus, crassissimus, 4 mm. longus; pericarpium laeve, lucidum, flavescens, siccitate rugatum.

Malay Peninsula. Perak: Gunong Batu Peak; at lower camp, *Wray*, 1174.

Litsea cylindrocarpa, *Gamble* [Lauraceae-Litseeae]; species *L. castaneae*, Hook. f., affinis, foliis magis coriaceis obovatis subglaucis, drupa elongata et tubo perianthii fructifero multo minore differt.

Arbor patula, ad 30–40 m. alta, 9–12 m. trunci diametro; ramuli modice crassi, laeves, grisei, juniores angulati minute griseo-puberuli sicut etiam inflorescentia. *Folia* coriacea, alterna, elliptica vel elliptico-oblonga vel obovata, apice obtuse acuta vel attenuata; supra nervis exceptis glabra, subtus minute puberula, 9–18 cm. longa, 4–9 cm. lata; costa gracilis, impressa; nervi utrinque 6–12, paralleli, profunde impressi, primo subrecti, deinde prope marginem curvati; nervuli transversi multi, paralleli, obscuri sicut reticulatio; petiolus 1–2·5 cm. longus, supra sulcatus et puberulus. *Flores* in umbellulis longiuscule (ad 1 cm.) pedunculatis in racemis griseo-pubescentibus axillaribus vel lateralibus ad 1·5–1·7 cm. longis saepe fasciculatis; racemi bracteae ovatae, acutae, deciduae; bracteae involucrales ovato-orbiculares, 4–5 mm. longae, concavae; flores in umbellulis 5; pedicelli breves, fusco-villosi; perianthii lobi oblongi, acuti, membranacei, villosi, 2–3 mm. longi. *Stamina* florum ♂ 8–13, plerumque 9, ordinum I et II ad 5 mm. longa, antheris ovatis et

filamentis villosis gracilibus, aliquando glandulis 1–2 prope basin; ordinum III et IV breviora et glandulis 2 parvis munita; ovarium rudimentarium rotundatum, villosum, stylo gracili, stigmate obliquo. *Staminodia* florum ♀ ignota. *Drupa* cylindrico-oblonga, 2 cm. longa, 7–9 mm. lata, apice obtusa, supra perianthii tubum incrassatum cupuliformem 5 mm. altum 7 mm. latum ore truncato insidens; pedicellus crassus, complanatus, 5 mm. longus; pericarpium rubrum, siccitate rugosum; cotyledones oblongi.

Malay Peninsula. Province Wellesley: at Nibong Tibal, *Curtis*, 3473; at Krian, *Ridley*, 9388. Perak: on low ground, *King's Collector*, 5500, 5568, 6207, 6673; at Bruas, *Burn-Murdoch*, 211.

Borneo. Base of Matang, *Ridley*, 11,673.

Litsea Wrayi, *Gamble* [Lauraceae-Litseeae]; species *L. salicifoliae*, Roxb., affinis, foliis minoribus, fasciculis umbellularum paucioribus et drupae cupula multo majore differt.

Arbor, ad 20–25 m. alta et 60 cm. trunci diametro; ramuli graciles, griseo-fulvi, juniores angulati, parce puberuli. *Folia* chartacea, alterna, elliptico-oblonga vel oblongo-lanceolata vel -oblanceolata, apice acuminata, basi longe attenuata vel acuta, supra lucida, glabra, infra rufescentia, glabra vel juniora puberula; 10–17 cm. longa, 3–5 cm. lata; costa gracilis, supra paullo impressa; nervi utrinque 10–13 vix impressi, obliqui, ultimi inter se arcuatim juncti; nervuli transversi graciles, irregulares, saepe ramosi; reticulatio areolata; petiolus gracilis, 1·5–2·5 cm. longus. *Flores* (alabastra tantum) in umbellulis breve pedunculatis in fasciculis vel racemis brevissimis axillaribus vel lateralibus; pedunculi 4–6 mm. longi, subglabri vel villosi; bracteae ovatae, caducae; bracteae involucrales 4–5, extus villosae, intus glabrae; flores in umbellulis 5–6; perianthii lobi 6, oblongi, obtusi vel acuti, extus villosi. *Stamina* florum ♂ 12, glabra, ordinum I et II antheris acutis; ordinum III et IV antheris obtusis glandulis 2 sessilibus filamentorum ad mediam partem; ovarium rudimentarium ovatum, stylo brevi, stigmate fisso. *Staminodia* florum ♀ etiam 12, glabra; ordinum I et II clavata, ordinum III et IV subulata, glandulis 2 sessilibus sicut in ♂. *Ovarium* ovoideum, stylo crasso curvato, stigmate capitato. *Drupa* globosa, apice paullo conica, 1 cm. diametro, supra perianthii tubum incrassatum albo-maculatum insidens; cupula juventute fere clausa, ore minimo, matura obconica, 8 mm. alta, 1·2 cm. diametro, margine truncato laevi; pedicellus incrassatus, paullo complanatus, 4 mm. longus; pericarpium album, cereum, siccitate flavum.

Malay Peninsula. Perak: at Waterfall Hill, *Wray* 1853, 4036; *Scortechini*; hill forests near Larut, 250–450 m., *King's Collector*, 6908, 7569.

Litsea Teysmanni, *Gamble* [Lauraceae-Litseeae]; species *L. Panamonjae*, Hook. f., affinis, foliis coriaceis obtusis vel abrupte acuminatis, racemis brevioribus glabris differt; *L. myristicaefoliae*, Hook. f., etiam affinis sed racemis longioribus et perianthii tubo fructifero differt.

Arbor; ramuli crassi, cortice pallido lenticellato, juniores nigrescentes. *Folia* coriacea, alterna, glabra; elliptico-oblonga vel obovata, apice obtusa vel abrupte cuspidato-acuminata, basi

acuta et saepe inaequalia, supra lucida, infra rufo-grisea, marginibus recurvis; 10–17 cm. longa, 4–6 cm. lata; costa mediocriter crassa, infra prominens; nervi utrinque 8–12, graciles, primo recti, sed marginem versus curvati et superiores arcuatim juncti; nervuli transversi irregulares, ramosi, reticulatione late areolata; petiolus crassus, 1·5–3 cm. longus. *Flores* in umbellulis pedunculatis in racemis gracilibus axillaribus 2–5 cm. longis; pedunculi 4–6 mm. longi; rhachis glabra, angulata, nigrescens; bracteae involucrales 4, minute puberulae vel glabrae; flores in umbellulis (♀ tantum) 5; pedicelli villosi, 1 mm. longi; perianthii tubus extus villosus, intus ore excepto glaber; perianthii lobi oblongi, obtusi, 1 mm. longi. *Stamina* florum ♂ nondum visa; staminodia florum ♀ 12, ordinum I et II clavata, filamentis parce villosis, ordinum III et IV subulata, apice rotundata vel acuta, glandulis 2 magnis ovatis ad basin. *Ovarium* ovoideum, stylo crasso primum curvato; stigmate peltato trilobo. *Drupa* primum ovoidea, deinde globosa, 1·5–1·8 cm. diametro, supra perianthii tubum incrassatum rugosum primum cupuliformem tandem complanatum 1·2 cm. altum margine undulatum insidens, pedunculo paullo complanato 1–5 cm. diametro; pericarpium maculatum, siccitate rugosum.

Malay Peninsula. Perak: at Kotah and Simpang, *Wray*, 2409, 3019; in dense jungle on low ground, *King's Collector*, 6689. Malacca: at Merliman, *Ridley*, 5845.

Bangka. *Teysmann.*

Borneo. Sarawak, *Beccari*, 1649, 4061.

Litsea machilifolia, *Gamble* [Lauraceae-Litseeae]; species *L. Teysmanni*, Gamble, affinis, foliis longe acuminatis, drupa minore et perianthii tubo fructifero crassiore differt.

Arbor, ad 12–24 m. alta et 40–50 cm. trunci diametro; ramuli graciles, nigrescentes. *Folia* coriacea, alterna; oblongo-lanceolata, apice longe acuminata, basi acuta vel cuneata, saepe inaequalia; supra lucida, glabra, infra glaucescentia et minute puberula, marginibus paullo recurvis; 10–20 cm. longa, 3–7 cm. lata; costa gracilis, prominens, praecipue infra; nervi utrinque 10–15, obscuri, immersi, curvati et prope marginem arcuatim juncti; nervuli transversi pauci, obscuri, reticulatione minute areolata; petiolus gracilis, siccitate niger, 1–2 cm. longus. *Flores* in umbellulis graciliter pedunculatis, in racemis glabris paniculatis axillaribus vel subterminalibus, 7–9 cm. (♂) vel 3–5 cm. (♀) longis; pedunculi 4–5 mm. longi; rhachis angularis, nigra; racemorum bracteae paucae, ovatae, caducae; bracteae involucrales 4–5, orbiculares, glabrae; flores in umbellulis 5, parvi; pedicelli 1 mm. longi, parce villosi; perianthii tubus 1–1·5 mm. longus, ore excepto glaber; perianthii lobi 6–8, 2 mm. (♂) vel 1 mm. (♀) longi, ciliati et glandulosi. *Stamina* florum ♂ 9–13, plerumque 12, glabra, ordinum I et II 2–3 mm. longa, antheris ovatis; ordinum III et IV breviora, glandulis binis stipitatis paullo supra filamentorum basim; staminodia florum ♀ 12–14, normaliter 12, ordinum I et II clavata, acuminata, 1 mm. longa, ordinum III et IV subulata, glandulis binis parvis ad mediam partem filamentorum. *Ovarium* florum ♂ rudimentarium, ovoideum, florum ♀ ovoideum, glabrum, stylo crasso curvato; stigmate capitato. *Drupa* globosa, 1 cm. diametro, ad dimidiam partem tubo perianthii incrassato 8 mm.

alto, 1·2 cm. lato suffulta ; pedicelli incrassati, clavati, complanati, 1–1·2 cm. longi ; pericarpium laeve, flavescens.

Malay Peninsula. Penang : Moniot's road, 300 m. *Curtis*, 795 ; *Scortechini*. Singapore : in garden jungle, *Ridley*, 4706, 3458.

Var. **angustifolia**, *Gamble*. *Folia* minora, angustiora, 2·5–3 cm. lata. *Paniculae* ramosae. *Stamina* plerumque 9. *Drupa* globosa 1·5–1·7 cm. diametro, in tubo perianthii incrassato rugoso, carnoso, complanato insidens ; pedicelli incrassati valde complanati et curvati, 1·4–2 cm. longi ; pericarpium primo viride, siccitate flavescens, rugosum.

Malay Peninsula. Perak : at Gunong Batu Patch, *Wray*, 416, 985, 1032, 1108 ; at Gunong Haram, *Scortechini*, 328, 588 ; Larut and Goping, *King's Collector*, 3561, 6113, 6815 ; Selangor : Bukit Kutu, *Ridley*, 7633. Malacca : at Brisu, *Derry*, 653. Singapore : at Bukit Mandai, *Ridley*, 6739 ; *King's Collector*, 1236.

XLVIII.—HYBRIDS RAISED AT KEW.

For many years past a number of hybrid plants have been raised at Kew, and in view of the general interest and importance of such work it has been considered advisable to bring together into as complete a record as possible the successes and failures in hybridization at Kew. In the following account, in order to facilitate reference, the hybrids have been arranged in alphabetical order, and in all cases the name of the female parent is placed first. They have been produced, as the list will show, in all the departments of the Royal Botanic Gardens.

Begonia Pink President Carnot (B. President Carnot × B. kewensis*).

This hybrid, raised in 1902, first flowered in 1904. It resembles the female parent in habit, in that the female flowers, which are pink in colour, remain on the plant for some time ; in addition to this, the male flowers, which in the mother plant do not open properly and drop off at an early stage, remain on the plant and open properly as in *B. kewensis*.

Begonia (B. coccinea × B. kewensis).

The hybrid was raised in 1902 and flowered in 1904. Habit intermediate between the two parents. The flowers are dull scarlet disposed in slender, pendulous inflorescences, as in *B. coccinea*.

Bravoa kewensis (B. geminiflora × B. [Prochynanthes] Bulliana).

The hybrid was produced in 1894 and flowered in 1899. Plant tufted, deciduous. Leaves 2 feet long, 1 inch in diameter. Inflorescence 4 feet high, bearing flowers in the upper part only. Perianth tubular, dull brownish-red on the outside, and yellow on the inside of the tube.

See note in Gardeners' Chronicle, 1899, xxvi., 112.

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* *B. kewensis* is a chance seedling or hybrid which originated at Kew about 15 years ago. It most nearly resembles *B. undulata*.

Brunsvigia (**Brunsvigia Josephinae** × **Amaryllis Belladonna** var. **kewensis**).

One seedling was obtained from this cross, which was made in September, 1898; it has not yet flowered, but is distinct in habit from both parents.

Calceolaria kewensis (**C. Jefferies' Hybrid** × **Herbaceous Varieties**).

This cross was made in 1904, the seedlings flowering in 1905. The plants were grown a second year and flowered profusely in May, 1906. *C. kewensis* seeds freely and comes true from seeds.

The plant is figured and described in the Gardeners' Chronicle, 1906, xxxix., 390, fig. 158.

Calceolaria (**C. Clibrani** × **Herbaceous Varieties**).

This cross was made in 1906 and the seedlings flowered the following spring. The blooms are about the same size as those of *C. kewensis*, but both habit and leaves are distinct. The pollen of six distinct colours of the herbaceous varieties was used on *C. Clibrani*, the result being a fairly wide range of colour and spotting in the flowers.

Callipsyche kewensis (**C. mirabilis** × **C. aurantiaca**).

Raised in 1898, flowered in 1901, seedlings show very little variation, and are intermediate in characters between the parents. The flowers are buff-yellow in colour, with long pendulous stamens of a creamy-white shade. The flowers of *C. amabilis* are white, while those of *C. aurantiaca* are orange. The hybrid is fertile, and seedlings have been raised from it.

Campanula (**C. thyrsoides** × **C. spicata**).

Plants intermediate in character between these two species appeared amongst a batch of seedlings raised in 1900 from seed of *C. thyrsoides* which had ripened in the Alpine House. The cross was probably effected by insects, the two parents being in flower at the same time in the house. Plants flowered the following year, having a longer, looser inflorescence than is usual in *C. thyrsoides*, while the flowers were also intermediate in character, Seeds saved from the hybrids did not retain their character, but reverted to *C. thyrsoides*.

Cheiranthus hybridus (**Cheiranthus mutabilis** × **C. Cheiri**—yellow variety).

A few seeds were obtained from this cross, made in 1897, and from one, *C. hybridus* was raised. This grows into a many-branched plant of more vigorous habit than the female parent. The fragrant flowers are small and borne in slender racemes in spring. They are purple throughout the early stages, but turn to a yellowish colour with age. It requires greenhouse culture.

Cheiranthus kewensis (**C. hybridus** × **C. Cheiri**—red variety).

The cross was made in May, 1899, and one plant was raised which flowered in January, 1900. Its leaves are similar to those of *C. Cheiri*, but the flowers are intermediate in character. The flowers are fragrant and borne freely in long racemes. They vary in colour, at different stages, from yellow to brown and then to purple. It is usually grown indoors and shows to the best advantage in sunny weather during February and March.

A description of the two hybrids was published in The Garden, 1901, lix., 178.

Cynorchis kewensis (C. purpurascens × C. Lowiana).

The seedlings raised from this cross, made in 1901, flowered in 1903. In habit they resemble *C. Lowiana*, the flowers being intermediate in size and dull purple-red in colour.

Cytisus kewensis (C. Ardoinii × C. albus).

This hybrid was obtained in 1891 through insect agency, and appeared among a batch of seedlings of the former parent. It is now widely cultivated in gardens. The habit is quite prostrate and the flowers of a pale sulphur-yellow.

Cytisus Beanii (C. Ardoinii × C. purgans).

This cross was also effected by some insect in 1892. It is a low bush with golden-yellow flowers.

Cytisus Dallimorei (C. scoparius var. Andreanus × C. albus).

The mother plant of the cross was grown in a pot and fertilised under glass in 1900. Only two plants were raised, one of which had pale yellow flowers and showed no influence of the mother plant in colour, but was of great vigour. The other, a much weaker plant, flowered in 1904 and had pale purple blossoms, and has been named *C. Dallimorei*. Grafted on stocks of Laburnum the hybrid is now showing plenty of vigour and is undoubtedly one of the most distinct and beautiful of the taller brooms. It was given an Award of Merit at the Temple Show of 1910.

See Gardeners' Chronicle, 1910, xlvii., 397. The hybrid is fertile, but it is not yet known whether it will breed true.

Disa kewensis (D. grandiflora × D. tripetaloides).

This hybrid was the result of a cross effected in 1891, and flowered in 18 months from the sowing of the seed. The flowers are intermediate in colour, 1½ inches in diameter, with bright rose lateral sepals; the dorsal sepal is hooded as in *D. tripetaloides*, light pink in colour, with a few light red spots. The labellum is concave, pink, shading off at the base to pale yellow, and spotted with light red. Figured in Gartenflora, 1903, t. 1510.

Disa Premier (D. tripetaloides × D. Veitchii).

This plant resulted from a cross made in 1891. *D. Veitchii*, the male parent, is itself a hybrid between *D. grandiflora* and *D. racemosa*. The flowers are rich rosy-crimson, larger than those of *D. racemosa*. It was exhibited at the Royal Horticultural Society meeting on October 10th, 1893, and received a First Class Certificate.

Epidendrum kewense (E. xanthinum × E. evectum). The reverse cross was also made.

The first seedling from this cross, made in 1899, flowered in 20 months from germination. These hybrids showed diverse shades of colouring, the bulk of them being dull red or buff, suffused with yellow.

A few flowers were self-pollinated and also recrossed with both parents. For further information, *see* Orchid Review, 1907, pp. 58, 122.

Freesia kewenis (F. Armstrongii × F. Leichtlini).

This cross was made in 1903 and the seedlings flowered in the following year. The flowers are pale lilac-pink, suffused with pale yellow in the throat, about 1 inch in diameter, with a long tapering

tube and spreading limb. The habit of the hybrid is erect and slender as in *F. Armstrongii*.

Gladiolus (G. dracocephalus × G. primulinus).

The cross was made in 1906, and the seedlings flowered in 1909–10.

The seedlings all showed the predominance of the male parent in the long slender inflorescence, glaucous foliage, and in the ground colour of the flower, which is yellow. The red stripes which are so characteristic of the mother plant are only faintly developed in the hybrid.

The reverse cross was made but no good seeds were obtained.

Gladiolus (G. Colvillèi albus × G. primulinus).

The cross was made in 1906, but only one plant flowered this year.

Habit intermediate; leaves glaucous; flowers buff-coloured, large and reflexed as in *G. Colvillei*, with deeper markings in the throat.

The seedlings are mostly weak and difficult to grow.

Gladiolus (G. primulinus × Lemoine's Hybrid—white variety).

The cross was made in 1906, and seedlings flowered in 18 months to two years from the date of germination.

Habit of seedlings intermediate; flowers with bright scarlet ground-colour, heavily blotched with pale lemon-yellow on the lip and throat. A few of the seedlings showed distinct striation with a darker shade of red. The flowers are about 3 inches in diameter and show the spreading or reflexed segments of the male parent.

Kalanchoe kewensis (K. flammea × K. Bentii).

Crossed in 1901 and flowered in 1902. The flowers are bright rose-pink in large corymbose cymes about a foot in diameter. Plant 2–4 feet high. The remarkable feature of this plant is that although both its parents have simple leaves, the hybrid has several leaves with one or two pairs of pinnae. It is described and figured in the Annals of Botany, xvii., pp. 435–441, pl. 21–23.

Kniphofia kewensis (K. pauciflora × K. Macowani).

Seeds sown in October, 1892. The plants flowered in October, 1893, the inflorescence being longer and looser than in *K. pauciflora*, while the flowers are tinged with red. It was published under the name of *K. pauciflora* × *Macowani* in the Gardeners' Chronicle, 1893, xiv., 424.

Lilium kewense (L. Brownii var. chloraster × L. Henryi).

Raised in July, 1897, seeds were sown the following November, and the first flower opened July 19th, 1900. The hybrid resembles *L. auratum* in habit, but the flowers are pale buff, with a few brown spots on the inner side of the segments. It is described and figured in The Garden, 1900, lviii., 99.

Musa kewensis (M. Mannii × M. rosacea).

This hybrid was produced in 1893. It has slender "stems" 3 feet high; leaves, 3–4 feet long, 6–10 inches broad; inflorescence a short spike, with decorative bright crimson bracts 4–6 inches long. Flowers in threes in the axils of each bract with a cream-coloured calyx and white petals. It flowered in 1895 and was figured for the Kew collection of drawings.

Nymphaea kewensis (N. Lotus var. alba × N. Devoniensis).

Raised in 1885; flowers large, 6 inches in diameter, with rosy-red petals and golden-yellow stamens. Habit as in *N. Lotus*.

N. Devoniensis itself is, by some botanists, referred to *N. Lotus*; others consider it to be a hybrid between *N. rubra* and *N. Lotus*. *N. kewensis* is figured in the Botanical Magazine, t. 6988.

Primula kewensis (P. floribunda × P. verticillata).

This hybrid appeared as a chance seedling among a batch of *P. floribunda* in 1899. It was exhibited at the meeting of the Royal Horticultural Society, February 27th, 1900, and was awarded a First Class Certificate. *See* the Gardeners' Chronicle, 1900, xvii., pp. 130, 195, fig. 63; Gardeners' Magazine, 1900, 232, with figs.

During the summer of 1900 the supposed parents were artificially crossed, and good seed was obtained from *P. floribunda*; a proportion of the resulting plants proved to be true *P. kewensis*.

During the summer of 1910 the following crosses were again made:—

No. 1. *P. verticillata** × *P. floribunda*.
„ 2. *P. floribunda* × *P. verticillata*.
„ 3. *P. verticillata* × *P. floribunda* var. *isabellina*.
„ 4. *P. floribunda* var. *isabellina* × *P. kewensis* (type).
„ 5. *P. floribunda* var. *isabellina* × *P. kewensis* (seedling form).
„ 6. *P. kewensis* × *P. floribunda* var. *isabellina*.

All the above crosses produced good seed with the exception of No. 6. No. 1 produced a quantity of what appeared to be good seed, but only a few plants have been raised; so far they are all unflowered.

Rehmannia Briscoei (R. Henryi × R. angulata).

This cross was made in 1908, the plants flowering in 1910. *R. Briscoei*—raised by Messrs. J. Veitch & Sons, and figured in the Gardeners' Chronicle, 1910, xlvii., 188—is the result of the reverse cross. The colour of the flowers is the same in the two hybrids, but the influence of *R. Henryi* is more marked in the Kew plant, in that it produces more numerous flowering growths from the base compared with the specimens of *R. Briscoei* produced by Messrs. Veitch. So far all attempts to fertilize the Kew hybrid either with its own pollen or that of either of the parents have proved abortive.

Rehmannia (R. Henryii × R. glutinosa).

A few plants have been raised this year but as yet have not flowered.

Rhododendron kewense (R. Griffithianum × R. Hookeri).

Crossed in 1874; flowered in the Temperate House in May, 1888. It has proved to be hardier than either parent, plants having withstood several winters in the Rhododendron Dell at Kew. It forms a sturdy, much branched plant, with leaves 6 to 10 inches long by 2 inches broad; the flowers, which are disposed

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* *P. verticillata* was also emasculated and carefully protected without being fertilized, and no seed was formed; the experiment was made in order to see whether ovules might not be produced by vegetative means.

in a large loose truss, are broadly campanulate, 3 inches across by 2 inches deep, of a pale flesh colour, the unexpanded buds being a deep rose.

See Gardeners' Chronicle, 1888, iii., 620, and The Garden, 1892, xlii., pl. 885.

Rhododendron (R. intricatum × R. indicum album).

The cross was made in 1908 and seedlings raised in 1909, but the plants have not yet flowered.

Rhododendron (R. Smirnowii × Named garden varieties).

A large number of hybrids was obtained from crosses made in 1893 and 1894, most of which were of very vigorous growth but inferior to the majority of garden varieties in their flowers. A few, such as those named "G. Thiselton-Dyer" and "Mrs. Prain," were of average merit. Hybrids from *R. Smirnowii* are likely to prove quite hardy.

Rhododendron Edith A. Boulton (R. Fortunei × R. Meteor).

This hybrid, produced in 1894, has proved to be one of the best of the *Fortunei* race of Rhododendrons—a race of considerable value in gardens, because they flower somewhat in advance of the better known hybrids and thereby lengthen the flowering season of the genus. It is curious in producing many flowers without stamens.

Rhododendron (R. Vaseyi × R. cinnabarinum).

Cross made in 1897.

The hybrid is a curious-looking small-leaved shrub which has not yet flowered.

Rhododendron (R. campylocarpum × R. Esmeralda).

One of the most desirable things in regard to the cultivation of Rhododendrons is the production of a race with good yellow flowers. It was thought that something in this way might be done by crossing these two, the former of which is pale yellow, the latter light red. About 25 hybrids were obtained from this cross made in 1897, only one of which has yet flowered, and this was as pale a yellow as the mother plant.

Rhododendron (R. Griffithianum × R. campylocarpum).

The hybrid, produced in 1898, bears cream-coloured flowers, but is not of striking merit.

Rhododendron Griffithianum ♀ was also crossed with various garden varieties. The best of the hybrids obtained were those from flowers pollinated with "Grand Arab" and "Ascot Brilliant." The trusses are red. The plants are only half-hardy at Kew.

Rhododendron (R. ciliatum × R. Edgeworthii).

The hybrid, obtained in 1900, is of interest in being exactly similar to the variety called "Princess Alice," a well-known greenhouse plant.

Rosa (R. macrophylla × R. rugosa).

It is impossible to obtain roses true from seed gathered from the plants growing together in the collection, because of the cross fertilization caused by bees. The result is nearly always a worthless mongrel, and the propagation of roses by seed from this source is no longer attempted. Amongst the hybrids formerly so raised, however, is a very handsome unnamed one with the

parentage given above. Its beauty is in its fruits, which are pear-shaped, as in *R. macrophylla*, but larger and of a brilliant scarlet-red. Miss E. Willmott is figuring this hybrid in her new work on the genus *Rosa*.

Senecio kewensis (Senecio [Cineraria] cruenta × Greenhouse Cinerarias).

In 1888 Kew introduced and flowered *Senecio* (*Cineraria*) *cruenta*, believed to be the progenitor of the popular race of greenhouse Cinerarias. It was afterwards crossed with the latter, and the seedlings thus obtained were known as Kew Cinerarias. Plants and seeds were distributed from Kew, and shortly afterwards a selection from them was shown by Messrs. Sutton & Sons under the name of *C. stellata*. Some of the Kew seedlings came fairly true from seeds and were known as "Kew Blue," "Kew White," &c.

Senecio Lady Thiselton-Dyer (S. Heritieri × Cineraria Kew Blue).

The cross was made in 1899.

The plant has the shrubby habit of *S. Heritieri*, and the blue and white flowers also show the ringed markings of the seed parent *S. Heritieri*. A plant was exhibited at the Royal Horticultural Society's meeting of April 28th, 1900.

See Gardeners' Chronicle, 1900, xxvii., p. 3 of supplement.

Shortia (S. uniflora grandiflora × S. galacifolia).

Cross made in 1910. The seeds were sown as soon as they were ripe and germinated in a short time, but the plants have not yet flowered. Flowers of *S. galacifolia* fertilized with pollen of *S. uniflora grandiflora* did not produce mature seed.

Spathoglottis kewensis (S. plicata var. Micholitzii × S. Vieillardii).

This hybrid, produced in 1900, flowered in 1903. The colour of the flowers mostly resembles that of the female, being bright reddish-purple, 2 inches in diameter, with the pale yellow markings on the lip and column which are characteristic of *S. plicata* var. *Micholitzii*.

Strelitzia kewense (S. Reginae × S. augusta).

Several plants were raised from the cross, made in March, 1898, one of which is growing in the Mexican House at Kew. This one flowered for the first time during the winter 1909–10 and was described as *S. kewense* in the Kew Bulletin, No. 2, 1910, p. 65. It is remarkable for its large leaves, which have blades 2 feet long and 15 inches wide. The flowers are pale ochre-yellow and blue.

See Gardeners' Chronicle, 1910, xlvii., 217, with figure.

Strelitzia (S. augusta × S. Reginae).

Several plants were obtained from the cross made in March, 1898, but as yet no flowers have appeared.

Streptocarpus Watsoni (S. parviflora × S. Dunnii).

Cross made in 1886, flowered in 1887.

The plant is monophyllous. Inflorescences numerous, produced in succession along the base of the midrib of the large single leaf. Flowers numerous, mauve-purple in colour shading to brownish-purple in the throat, 2 inches long, $1\frac{1}{4}$–$1\frac{1}{2}$ inches broad. Plant dies after flowering, producing no seed.

See Gardeners' Chronicle, 1887, ii., 214, fig. 52.

Streptocarpus kewensis (S. Rexii × S. Dunnii).

Cross made in 1886, seedlings flowered in 1887.

Habit as in *S. Rexii*, that is, it forms several leaves to each plant. Flower stems numerous, 3–8-flowered, bearing a compact mass of flowers as in *S. Dunnii*. Flowers mauve-purple, with brownish-purple marking in the throat.

See Gardeners' Chronicle, 1887, ii., 246, fig. 61.

Streptocarpus White Pet (S. Rexii × S. parviflora).

Cross made in 1886, plants flowered in 1887.

Habit as in *S. Rexii*; leaves 2 or more, 5–7 inches long, 2–3 inches broad. Inflorescence 4–6 inches high, bearing 2–5 flowers.

Streptocarpus Dyeri (S. Dunnii × S. Wendlandii).

Cross made in 1892, plants flowered in 1894–95.

Plant monophyllous; leaf 2–3 feet long and 16–18 inches broad. Inflorescence an erect, many-flowered cyme, 12–30 inches high; flowers reddish-purple. Figured in Garden and Forest, 1895, fig. 1.

For further particulars of the Kew hybrid *Streptocarpi*, see Gardeners' Chronicle, 1890, viii., 410.

Failures.

Hippeastrum × *Vallota purpurea.*
Hippeastrum × *Clivia miniata.*
Impatiens Oliveri × *I. Sultani.*
I. Oliveri × *I. Herzogii.*
Meconopsis aculeata × *M. heterophylla.* Seeds from this cross ripened and appeared to be good, but did not germinate.
Oxalis enneaphylla × *O. adenophylla.*
Primula kewensis × *P. floribunda.*
P. malacoides × *P. obconica.*
P. megaseaefolia × *P. obconica.*
P. obconica × *P. sinensis.*
P. sinensis × *P. verticillata.*
P. sinensis × *P. vulgaris.*

In nearly every case the reverse cross was also made.

Among shrubs, failures have been experienced with Hypericums and Ericas, not due, however, to any inherent incapability of hybridization in these genera, but to accident or defective fertilization.

XLIX.—DIAGNOSES AFRICANAE: XXXVIII.

1141. **Cliffortia Burchellii**, *Stapf* [Rosaceae-Poterieae]; affinis *C. juniperinae*, Linn. f., sed ramulis glaberrimis stricto-erectis, sepalis masculis elliptico-ovatis, sepalis femineis basi connatis triangulari-ovatis incrassatis maturis in conum arcte conniventibus, stylo cylindrico incrassato differt.

Frutex ramosissimus, erectus; ramulis glaberrimis stricto-erectis neque divaricatis. *Folia* trifoliolata, sessilia; foliola subulata, apice breviter mucronata, undique glabra, dorso rotundato-carinata, primo

subconcava, deinde supra leviter canaliculata, marginibus subscabridis, 1·5–2 cm. longa ; stipulae amplexicaules, subulatae. *Flores* ♂ solitarii vel duo in ramulis ad foliorum fasciculos reductis ; bracteae ovato-lanceolatae, mucronato-acuminatae, 4–5 mm. longae, scariosae. *Sepala* 3, elliptico-ovata, mucronato-acuta, sub apice glandulis papillosis notata, 6–8-nervia. *Stamina* circiter 10-12. *Flores* ♀ in spiculas breves secundum ramos laxe dispositas aggregati ; bracteae e basi amplexicauli late ovata in subulam productae, inferne 4 mm. latae. *Sepala* 3, basi connata, triangulari-ovata, acuta, in fructu persistentia, in conum arcte conniventia, circa 3 mm. longa, incrassata, ima basi constricta. *Stylus* erectus, cylindrico-incrassatus. *Stigma* plumosum. *Fructus* oblongo-ellipsoideus, 5–6 mm. longus, leviter costatus.

Cape Colony. George Div., *Burchell*, 5090, 5736 ; Outeniqua Mountains, *Rehmann*, 176. Knysna Div., *Burchell*, 5186.

1142. **Crotalaria lachnosema**, *Stapf* [Leguminosae-Genisteae] ; affinis *C. lachnophorae*, A. Rich., sed foliis brevius petiolatis, stipulis subulatis vel filiformibus, corollae carina et vexillo densissime villosis distincta.

Suffruticosa, ad 2 m. alta (teste *Barter*). *Caulis* superne ramosus, teres, fulvo-tomentosus. *Folia* 3-foliolata ; foliola oblonga, basin versus paulo cuneatim angustata, apice obtusissima, cuspidulata, intermedium 6–7·5 cm. longum, 1·8–2·5 cm. latum, lateralia ad 5 cm. longa, omnia subsessilia, supra adpresse pubescentia, infra velutina ; petiolus 0·8–1·2 cm. longus, tomentosus ; stipulae subulatae vel filiformes, 6–8 mm. longae, deciduae. *Racemi* terminales, pauciflori, fulvo-tomentosi ; bracteae subulato-lanceolatae, acuminatae, 6 mm. longae ; bracteolae filiformes, 6–8 mm. longae ; pedicelli 8 mm. longae. *Calyx* dense fulvo-tomentosus, 1·2 cm. longus, ad $\frac{2}{3}$ quinquefidus, lobis triangulari-lanceolatis subaequalibus. *Corolla* flava, vexillum orbiculato-ellipticum, 1·8 cm. longum, breviter unguiculatum, dorso fulvo-velutinum ; alae glabrae, lamina oblonga, 1·8 cm. longa, 6 mm. lata, ungue 4 mm. longo ; carina oblique semicircularis (a latere visa), 2 cm. longa, medio 1·2 cm. alta, rostro vix 8 mm. longo obtuso et marginibus liberis exceptis omnino fulvo-villosa. *Legumen* cylindricum, obtusum, densissime ferrugineo-tomentosum, ultra 2·5 cm. longum, 1 cm. diametro. *Semina* (immatura) reniformia, fere 4 mm. longa, ultra 20. *C. lachnocarpa*, Baker in Oliv. Fl. Trop. Afr., ii. p. 33 (quoad pl. Barteri).

Tropical Africa. Liberia : Kakatown, *Whyte*. Nigeria : Nupe, *Barter*, 920.

1143. **Pterocarpus Osun**, *Craib* [Leguminosae-Dalbergeae] ; a *P. Zenkeri*, Harms, cui affinis ramulis aculeatis, foliolis distincte mucronatis, nervis haud tam obliquis, fructu majore haud subglabro differt.

Arbor magna, 60 cm. diametro attingens (*ex Punch*) ; ramuli teretes juventute brunneo-tomentelli, mox glabri, aculeati, aculeis aliis deciduis aliis durescentibus. *Folia* 13–15 foliolata, 20–31 cm. longa ; petioli 4·5–5 cm. longi, cum rachi brunneo-tomentelli, glabrescentes, supra canaliculati ; stipulae deciduae, lineari-lanceolatae, acutae, ad 1·5 cm. longae, 3·5 mm. latae, utrinque fulvo-tomentellae ; foliola alterna, plerumque oblonga, apice acuminata, mucronata vel

rarissime leviter emarginata, basi rotundata vel truncata, ad 13 cm. longa 5·3 cm. lata, juventute subtus, costa densius, parce pilosula, matura glabra, coriacea, margine integro, nervis lateralibus utrinque circiter 10 subtus prominulis cum nervulis supra conspicuis ; petioluli circiter 5 mm. longi ut in petiolis tomentelli. *Inflorescentia* ignota. *Fructus* sicco pallide brunneus, rotundatus, ad 12 cm. diametro, alis chartaceis ad 5 cm. latis pilulosis parcissime aculeatis, umbone dense aculeato aculeis basi incrassatis, stipite 1·3 cm. longo. *Semina* solitaria, oblonga, 2 cm. longa, brunnea, nitida.

Tropical Africa. Southern Nigeria : Ekam, *Holland*, 198. Lagos ; Ibadan Forest Reserve, *Punch*, 114 ; Ibadan, Fiditi, *Unwin* ; Western Province, *Unwin*, 1 ; Mamu, *Unwin* ; without locality, *Dodd*, 405.

From information supplied at various times to Kew and to the Imperial Institute it appears that the natives of S. Nigeria use five distinct plants for the production of red dye :—*Pterocarpus Osun*, *P. erinaceus*, Poir., *P. esculentus*, Sch. et Thonn., *Baphia nitida*, Afz., and a species of *Dracaena*. Of these the most important appear to be *P. Osun* and *Baphia nitida*. The latter gives a scanty supply from the place where the trunk has been injured, but with the former a more prolonged treatment is apparently necessary—it does not give the necessary dye when newly cut, so the natives allow it to lie in water in a cool place for 5 to 10 years.

According to Punch the natives give the name Osun or Irosun to both *P. Osun* and *B. nitida*. Dodd gives the native name Osun for *P. Osun*, and Unwin says the Yoruba name for *P. Osun* is Osun and the Benin name Ume. Unwin further reports that both trees are confined to the wet or forest region and are known as Iro-usun-pupa, implying that the colour of the wood is red, and Iro-usun-dudu, meaning black camwood.

In the letters accompanying the specimens the name camwood has been applied to the products of both trees, but barwood has only been used once and that to the product of *P. Osun*. A detailed account of camwood and barwood will shortly be published in "The Useful Plants of Nigeria," *K.B.*, Add. Ser. ix., Part II.

The native names for the other dye-producing plants quoted above are :—Ope Kankana or Osun Buke (*Dracaena* sp.), Apepe or Ara (*P. erinaceus*), Gbingbindo (*P. esculentus*).

1144. **Leucospermum Bolusii**, *Phillips* [Proteaceae-Proteeae] ; a *L. grandifloro*, R. Br., stigmatibus truncatis differt.

Rami villosi. *Folia* 5·5–9 cm. longa, 1·2–2 cm. lata, oblongo-lanceolata vel oblanceolata, apice obtusa, superne 3–5-obtuso-dentata, basi angustata, distincte venosa, minute sed distincte tomentosa. *Capitula* pedunculata, 5–6·25 cm. longa, circiter 3·75 cm. lata, pedunculo 1·8–2·4 cm. longo tomentoso bracteas ovatas acuminatas tomentosas gerente ; bracteae flores subtendentes 1·3 cm. longae, 7·5 mm. latae, obovato-spathulatae, aristatae, dense villosae, ciliatae. *Calycis tubus* 0·9–1 cm. longus, glaber ; lobi 1·7–1·9 cm. longi, spathulato-lineares, glabri, ciliati, apice dilatato 4 mm. longo ovato subacuminato subobtuso nigro-setoso paullo barbigero. *Stamina* sessilia, 2 mm. longa ; antherae ovatae. *Stylus* 4·5–5 cm. longus,

linearis, superne quadrangularis. *Stigma* 1·4 mm. latum, obliqum, truncatum. *Ovarium* 3 mm. longum, pilis longis vestitum. *Squamae* hypogynae 1·5 mm. longae, lineares, acuminatae, apice acutae.

South Africa. Bredasdorp Div.: near Elim, *Bolus*, 8586.

1145. **Leucospermum Dregei**, *Phillips* [Proteaceae-Proteeae]; affine *L. tomentoso*, R. Br., bracteis involucri acutis superne glabris differt.

Frutex erectus, 1·5–6 m. altus. *Rami* tomentosi, interdum pilosi. *Folia* 4·5–6·5 cm. longa, 3–6·5 mm. lata, linearia vel oblongo-linearia, apice obtusa, integra vel superne 3-obtuso-dentata, basi paullo angustata, vel attenuata, minute sed dense tomentosa. *Capitula* sessilia, 1·5–2·5 cm. longa, circiter 2–2·5 cm. lata, apice ramorum 2–4-nata. *Bracteae* 1–1·2 cm. longae, 3–5·5 mm. latae, ovatae, acuminatae, apice acutae, inferne pubescentes vel dense villosae, ciliatae, superne glabrae. *Calycis tubus* 4·5 mm. longus, glaber; lobi 1·5 cm. longi, spathulato-lineares, glabri, breviter ciliati, apice dilatato 3·5 mm. longo elliptico subacuto glabro vel pubescente. *Stamina* sessilia, 2 mm. longa; antherae oblongae. *Stylus* 1·5 cm. longus, trigonus, basi distincte incrassatus, supra ovarium constrictus. *Stigma* 2 mm. longum, cylindricum, obtusum, sulcatum. *Ovarium* 3 mm. longum, ellipticum, pilis longis vestitum.

L. tomentosum, var. *a* R. Br. in Trans. Linn. Soc., x. p. 102; Roem. & Schultes, Syst. Veg. iii. p. 360 (var. *a* only); var. *Dregei*, Meisn. in DC. Prodr., xiv. p. 258; *Leucadendrum parile*, Knight, Prot. p. 57.

South Africa. Malmesbury Div.: Groene Kloof, *Drège*; *Bolus*, 4324; *Zeyher*, 1467; between Klipfontein and Predikstoel, *Zeyher*, 1467; between Groene Kloof and Dassenberg, *Drège*; between Groene Kloof and Saldanaha Bay, *Drège*; Zwartland, *Zeyher*. Paarl Div.: Paarlberg, *Niven*.

1146. **Leucospermum glabrum**, *Phillips* [Proteaceae-Proteeae]; verisimiliter *L. conocarpo*, R. Br., affine, ramis et foliis glabris differt.

Frutex 2 m. altus. *Rami* minute tomentosi. *Folia* 5–10 cm. longa, 1·25–3·75 cm. lata, oblongo-obovata, oblanceolata vel lanceolata, apice acuta, subacuta vel obtusa, superne 8–13-obtuso-dentata, raro integra vel 1–7-dentata, basi angustata, distincte venosa, glabra. *Capitula* subsessilia, 5–7·5 cm. longa, 3·75–6·25 cm. lata. *Florum bracteae* 1·25 cm. longae, 7 mm. latae, obovatae, acuminatae, dense villosae. *Calycis tubus* 1 cm. longus, glaber; lobi 3·75–4·5 cm. longi, spathulato-lineares, superne breviter villosi, inferne pilosi, apice dilatato 6 mm. longo ovato acuto piloso. *Stamina* sessilia, 4·5 mm. longa; antherae oblongae, eglandulosae. *Stylus* 5 cm. longus, linearis, basi paullo ventricosus, glaber. *Stigma* 6 mm. longum, ovato-lanceolatum, apice subacutum. *Ovarium* 2 mm. longum, oblongum, longis pilis vestitum. *Squamae* hypogynae 1·5 mm. longae, lanceolatae, apice subacutae.

South Africa. George Div.: Forest near Touw River, *Burchell*, 5726; Springfield and edge of the Forest near the Poort, *Bowie*; between Cape Town and George Town, *Rogers*. Knysna Div.: Plettenberg Bay, *Bowie*; without locality, *Mund*.

1147. **Leucospermum incisum**, *Phillips* [Proteaceae-Proteeae]; a *P. mixto*, Phillips, forma stigmatis differt.

Rami pilosi vel minute tomentosi. *Folia* 6·25 cm. longa, 1·2–1·8 cm. lata, oblonga, vel oblongo-lanceolata, superne profunde 6–7-dentata, raro 5-dentata, basi rotundata, distincte venosa, glabra, vel inferne aliquando sparse pilosa. *Capitula* subsessilia, 6·25 cm. longa, circiter 5 cm. lata. *Calycis tubus* 6 mm. longus, glaber; lobi 3·2 cm. longi, spathulato-lineares, paullo tomentosi, longo-ciliati, apice dilatato 4 mm. longo ovato acuto pilis longis crassis vestito. *Stamina* 3 mm. longa; connectivum triangulariter dilatatum; lobi antherarum oblongi, connectivo superne adnati. *Stylus* 3 cm. longus, linearis, superne paullo quadrangularis, glaber. *Stigma* 3 mm. longum, ovato-conicum, apice subobtusum. *Ovarium* 2 mm. longum, oblongum.

South Africa. Worcester Div.: Breede River, near Darling Bridge, *Bolus*, 5235.

1148. **Leucospermum mixtum**, *Phillips* [Proteaceae-Proteeae]; verisimiliter *L. glabro*, Phillips, et *L. inciso*, Phillips, affine, ramis tomentosis et forma stigmatis differt.

Rami dense tomentosi. *Folia* 3·5–10·5 cm. longa, 1–3 cm. lata, lanceolata vel late-oblonga, apice obtusa, integra vel superne 3–6-dentata, basi angustata vel subcordata, distincte vel subdistincte venosa, glabra. *Capitulum* pedunculatum, 6 cm. longum, circiter 4·5 cm. latum, pedunculo 2·5 cm. longo villoso bracteas ovatas acuminatas apice acutas tomentosas 6 mm. longas gerente; bracteae flores subtendentes 1·5 cm. longae, 5 mm. latae, spathulatae, longe acuminatae, apice acutae, villosae, ciliatae. *Calycis tubus* 9 mm. longus; laminae 1·7 cm. longae, spathulato-lineares, pubescentes, apice dilatato 3 mm. longo ovato subacuto pubescente. *Stamina* sessilia, 1·75 mm. longa; antherae ovatae. *Stylus* 5·5 cm. longus, curvatus, superne quadrangularis, glaber. *Stigma* 1·75 mm. latum, truncatum, apice prominenter carinatum. *Ovarium* 3 mm. longum, ellipticum, pilis longis vestitum.

South Africa. From a specimen without locality or collector's name preserved in the Kew Herbarium.

1149. **Leucospermum Muirii**, *Phillips* [Proteaceae-Proteeae]; a *L. patulo*, R. Br., foliis majoribus differt.

Frutex 2 m. altus. *Rami* minute tomentosi, demum glabri. *Folia* circiter 2·2–5 cm. longa, 3–5·5 mm. lata, lanceolata, vel obovato-linearia, apice obtusa, superne 3–7-obtuso-dentata, basi attenuata, glabra. *Capitula* pedunculata, 2·5 cm. longa, circiter 2 cm. lata, pedunculo 9 mm. longo tomentoso bracteas lineares tomentosas gerente. *Bracteae flores* subtendentes 5·5 mm. longae, 3–4 mm. latae, obovatae, acuminatae, apice truncatae, dense villosae, ciliatae. *Tubus calycis* 2–3·75 mm. longus, glaber; lobi 1–1·3 cm. longi, spathulato-lineares, breviter villosi, apice dilatato 3 mm. longo elliptico interdum paullo acuminato obtuso piloso barbigero. *Stamina* sessilia, 2 mm. longa; antherae ovato-lanceolatae. *Stylus* 1·7 cm. longus, cylindricus, superne quadrangularis. *Stigma* 1–1·5 mm. longum, clavatum vel oblongo-conicum, apice obtusum, sulcatum. *Ovarium* 1·5 mm. longum, oblongum, pilis longis vestitum. *Squamae* hypogynae 1·4 mm. longae, lanceolato-lineares, apice subacutae.

South Africa. Riversdale Div.: Milkwoodfontein, *Galpin*, 4457; Zandhoogte, *Muir in Herb. Galpin*, 5309.

Named in honour of Dr. J. Muir, an enthusiastic South African collector. *Protea Susannae*, Phillips, *K.B.* 1910, p. 229, was named after Mrs. Muir, who has helped her husband with his collections.

1150. **Spatalla Bolusii**, *Phillips* [Proteaceae-Proteeae]; a *S. colorata*, Meisn., ramis albo-villosis et foliis albo-pilosis differt.

Rami dense albo-villosi. *Folia* 0·9–1·3 cm. longa, erecta, filiformia, apice acuta, mucronata. *Capitula* uniflora, in racemis sessilibus terminalibus solitariis 1·3–2·5 cm. longis. *Bracteae* 5 mm. longae, lineares, acutae, ciliatae, pilosae, pedunculo longiores. *Pedunculus* 1 mm. longus, pilosus. *Involucrum* 4 mm. longum, basi connatum, bilabiatum, pilosum, ciliatum; labium inferum profunde tripartitum; segmenta linearia, acuminata, acuta; segmentum medium 2 mm. longum. *Calycis tubus* 3 mm. longus, glaber; lobi 4 mm. longi spathulato-lineares, villosi, apice dilatato 1·6 mm. longo ovato acuto dense villoso barbigero. *Stamina* 3·75 mm. longa, apice glandulis minutis instructa. *Stylus* 7 mm. longus, filiformis, supra curvus. *Stigma* 0·75 mm. longum, obovatum. *Ovarium* circiter 1 mm. longum, villosum.

South Africa. Riversdale Div.: Garcia's Pass, *Bolus*, 11,361.

1151. **Spatalla brachyloba**, *Phillips* [Proteaceae-Proteeae]; a *S. cylindrica*, Phillips, dentibus labii exterioris et foliis brevioribus differt.

Frutex circiter 30 cm. altus. *Rami* pilosi, demum glabri. *Folia* 1·3–1·5 cm. longa, filiformia, apice subacuta, mucronata, subtiliter pilosa, demum glabra. *Capitula* pedunculata, uniflora, in racemis terminalibus sessilibus solitariis vel 2-natis, 2–2·5 cm. longis. *Bracteae* 4 mm. longae, lineares, apice subacutae, pilosae, ciliatae, pedunculo longiores. *Pedunculus* 2·5 mm. longus, pilosus. *Involucrum* 2·5 mm. longum, bilabiatum, pilosum; labium inferum tridentatum; dentes ovati, apice obtusi, ciliati, medius 0·75 mm. longus. *Calycis tubus* 1·5 mm. longus, glaber; lobi 2·6 mm. longi, spathulato-lineares, villosi, apice dilatato 1·6 mm. longo elliptico obtuso villoso dense barbigero. *Stamina* subsessilia, 0·75 mm. longa, orbiculata, glandulis minutis instructa. *Stylus* 4·5 mm. longus, filiformis. *Stigma* 0·75 cm. longum, obovatum, facie tuberculo minuto instructum. *Ovarium* 0·75 cm. longum, ovatum, dense villosum. *Squamae* hypogynae 0·75 mm. longae, lanceolatae, acuminatae, apice acutae.

South Africa. Stellenbosch Div.: Hottentots' Holland Mts., near Sir Lowry's Pass, *MacOwan in Herb. Austro-Afric.*, 1762; *MacOwan in Cape Government Herbarium.*

1152. **Spatalla Burchellii**, *Phillips* [Proteaceae-Proteeae]; a *S. sericea*, R. Br., foliis brevioribus et glabris differt.

Frutex circiter 0·5 m. altus. *Rami* pilosi, demum glabri. *Folia* 0·6–1·3 cm. longa, filiformia, apice acuta, mucronata, supra unisulcata, glabra vel aliquando sparse pilosa. *Capitula* uniflora, in spicis sessilibus terminalibus solitariis 0·6–1·2 cm. longis. *Bracteae* 4 mm. longae, lineares, acuminatae, apice acutae, longe ciliatae, involucris subaequales. *Involucrum* 3 mm. longum, basi connatum, bilabiatum, hirsutum; labium inferum profunde trifidum; laminae ovatao-lanceolatae, acuminatae, apice subacutae, ciliatae. *Calycis*

tubus 1·5 mm. longus; lobi 4·5 mm. longi spathulato-lineares, villosi, apice dilatato ovato villoso barbigero dense. *Stamina* 0·5 mm. longa, orbiculata, apice glandulis minutis globosis instructa. *Stylus* 3·5 mm. longus, cylindricus. *Stigma* 0·5 mm. longum, obovatum. *Ovarium* 1 mm. longum, globosum, dense villosum. *Squamae* hypogynae 0·75 mm. longae, lineares.

South Africa. George Div.: Cradock Berg, near George, *Burchell*, 5899.

1153. **Spatalla cylindrica**, *Phillips* [Proteaceae-Proteeae]; a *S. longifolia*, Knight, inflorescentiis sessilibus, a *S. Galpinii*, Phillips, foliis longioribus differt.

Rami dense pilosi, demum glabri. *Folia* 2·5–4 cm. longa, filiformia, apice obtusa, obtuse mucronata, supra 1-sulcata, dense villosa, demum glabra. *Capitula* pedunculata, uniflora, in racemis terminalibus sessilibus solitariis 4·5–5 cm. longis. *Bracteae* 2·5 mm. longae, pedunculo subaequales. *Pedunculus* 3 mm. longus, hirsutus. *Involucrum* 2·5 mm. longum, bilabiatum, sericeo-pilosum, ciliatum; labium inferum tridentatum; dentes ovati, apice subacuti, medius 1 mm. longus. *Calycis tubus* 1 mm. longus; lobi 4–5 mm. longi, spathulato-lineares, superne albo-hirsutae, in medio nigro-setosae, apice dilatato 1 mm. longo ovato acuto villoso dense barbigero. *Stamina* subsessilia, 0·75 mm. longa, orbiculata, apice glandulis minutis globosis instructa. *Stylus* 4·5 mm. longus, filiformis. *Stigma* 1 mm. longum, obovatum. *Ovarium* 1 mm. longum, globosum. *Squamae* hypogynae 1·5 mm. longae, lineares.

South Africa. Stellenbosch Div.: Mts. round Sir Lowry's Pass, *Burchell*, 8212; *Schlechter*, 7230.

1154. **Spatalla ericoides**, *Phillips* [Proteaceae-Proteeae]; a *S. sericea*, R. Br., foliis brevioribus differt.

Rami pubescentes, demum glabri. *Folia* 5–7 mm. longa, apice subobtusa, obtuse mucronata, supra unisulcata, sparse pilosa, demum glabra. *Capitula* uniflora, in spicis terminalibus solitariis 1·5–2·0 cm. longis. *Bracteae* 3 mm. longae, ovato-lanceolatae, acuminatae, apice subacutae, dense pilosae, ciliatae. *Involucrum* 5 mm. longum, basi connatum, bilabiatum, dense sericeo-pilosum; labium inferum tridentatum, dentes laterales ovati, apice acuti, dense ciliati, medius angustior, dense ciliatus. *Calycis tubus* 1·5 mm. longus, glaber; lobi 4·5 mm. longi, spathulato-lineares, paullo tomentosi, apice dilatato 1 mm. longo ovato obtuso villoso barbigero dense. *Stamina* sessilia, 0·75 mm. longa, ovata, apice glandulis minutis ovatis instructa. *Stylus* 5 mm. longus, filiformis. *Stigma* 0·75 mm. longum, obovatum, basi subacutum, facie tuberculo minuto instructum. *Ovarium* 0·75 mm. longum, villosum. *Squamae* hypogynae 1 mm. longae, lineares.

South Africa. Without collector or locality *in Herb. Austro-Afric.*

1155. **Spatalla Galpinii**, *Phillips* [Proteaceae-Proteeae]; a *S. longifolia*, Knight, dentibus labii exterioris brevioribus differt.

Rami albo-hirsuti, demum glabri. *Folia* 1·3–1·7 cm. longa, filiformia, apice acuta, mucronata, supra 1-sulcata, basi vix attenuata, pilosa, demum glabra. *Capitula* pedunculata, uniflora, in racemis terminalibus pedunculatis solitariis vel 2-natis 2·5–4 cm. longis; pedunculus 1·3 cm. longus, hirsutus. *Bracteae* 5 mm. longae,

lineares, apice subacutae, basi ciliatae, pedunculo longiores. *Pedunculus* circiter 1·3 cm. longus, hirsutus. *Involucrum* 3 mm. longum, bilabiatum, pilosum, ciliatum ; labium inferum tridentatum ; dentes ovati, subacuminati, apice acuti ; medius dens 0·75 mm. longus. *Calycis tubus* 1·5 mm. longus ; lobi 4 mm. longi, spathulato-lineares, superne albo-hirsuti, glabri, paullo nigro-setosi ; apice dilatato 1 mm. longo ovato dense villoso. *Stamina* sessilia, 0·75 mm. longa, orbiculata, apice glandulis minutis instructa. *Stylus* 4 mm. longus, filiformis, aliquid compressus, paullo sulcatus. *Stigma* 1 mm. longum, obovatum. *Ovarium* 1 mm. longum, globosum, dense villosum. *Squamae* hypogynae 0·15 mm. longae, lineares.

South Africa. Without locality, *Thoms.* Caledon Div.: Klein River, *Schlechter*, 7608 ; Hermanuspetrusfontein, *Galpin*, 4485. Stellenbosch Div.: Hottentots' Holland Mts., *Pappe*, 6.

1156. **Spatalla mucronifolia**, *Phillips* [Proteaceae-Proteeae] ; a *S. nana*, Knight, et *S. procera*, Knight, foliis brevioribus differt.

Rami pilosi vel tomentosi. *Folia* 1–1·7 cm. longa, linearia, apice acuta, mucronata, supra unisulcata, pilosa. *Capitula* 3–4-flora in terminalibus racemis sessilibus vel subsessilibus solitariis vel 3–5-natis, 2·5–4 cm. longis. *Bracteae* 5 mm. longae, ovato-lanceolatae, apice acutae, pilosae, ciliatae, pedunculo longiores. *Pedunculus* 2 mm. longus, villosus. *Involucrum* 5 mm. longum, basi connatum, bilabiatum, pilosum ; labium superum obsoletum ; labium inferum profunde tripartitum ; segmenta 4 mm. longa, ovata, acuminata, apice acuta, ciliata. *Calycis tubus* 2 mm. longus ; lobi 4·5 mm. longi, spathulato-lineares, villosi, apice dilatato 3 mm. longo ovato vel elliptico obtuso dense villoso. *Stamina* sessilia, 1 mm. longa, apice glandulis ovatis instructa. *Stylus* 6 mm. longus, cylindricus, oblique insertus. *Stigma* 0·75 mm. longum, ellipticum, facie tuberculo minuto instructum. *Ovarium* 1·5 mm. longum, oblongum, villosum. *Squamae* hypogynae 2 mm. longae, lineares.

South Africa. Clanwilliam Div.: Cederberg Mts., at Pakhuis Pass, *Bolus*, 9083 ; Pakhuisberg, *Schlechter*, 10,814, 8611 ; without precise locality, *Drège* ; *Wallich*.

1157. **Spatalla pilosa**, *Phillips* [Proteaceae-Proteeae] ; a *S. molli*, R. Br., dentibus labii exterioris brevioribus, a *S. nivea*, R. Br., foliis bracteis brevioribus differt.

Rami dense pilosi, demum inferne pubescentes vel glabri. *Folia* 1·2–1·9 cm. longa, filiformia, apice subobtusa, subacute mucronata, minute punctata, dense pilosa, demum glabra. *Capitula* pedunculata, uniflora, in terminalibus solitariis racemis 2·0–2·5 cm. longis. *Bracteae* 3·5 mm. longae, lineares, apice acutae, ciliatae, pedunculo longiores. *Involucrum* 2·5 mm. longum, bilabiatum, pilosum ; labium inferum bipartitum ; dentes 1·5 mm. longi, ovati, apice acuti, ciliati; pedunculus 2·5 mm. longus, pilosus. *Calycis tubus* 1·5 mm longus, glaber ; lobi 3 mm. longi, spathulato-lineares villosi, apice dilatato 0·6 mm. longo ovato subacuto villoso dense barbigero. *Stamina* sessilia, 0·75 mm. longa, apice glandulis minutis ovatis instructa. *Stylus* 4 mm. longus, filiformis. *Stigma* 0·75 mm. longum, oblique obovatum, facie tuberculo minuto instructum. *Ovarium* 0·75 mm. longum, pilosum. *Squamae* hypogynae 0·75 mm. longae, lineares.

South Africa. Stellenbosch Div.: Hottentots' Holland Mts., ***Zeyher*, 3720 (partly).**

1158. **Spatalla Wallichii**, *Phillips* [Proteaceae-Proteeae] ; a *S. mucronifolia*, Phillips, foliis supra haud unisulcatis differt.

Frutex decumbens. *Rami* tomentosi, demum glabri. *Folia* 6–8 mm. longa, filiformia, apice acuta, mucronata, paullo incurva, supra plana, infra convexa, pilosa, demum glabra. *Capitula* 3–4-flora, in racemis laxis terminalibus pedunculis solitariis vel 2–3-natis, 2–3 cm. longis ; pedunculus racemi villosus. *Bracteae* 4 mm. longae, lanceolatae vel lineari-lanceolatae, apice acutae, 3–5-nerves, ciliatae, pilosae. *Pedunculus* capituliger 2 mm. longus, villosus. *Involucrum* basi connatum, 4 mm. longum, bilabiatum, ciliatum, pilosum ; labium inferum inaequaliter tripartitum. *Calycis tubus* 2 mm. longus, villosus, basi glaber ; lobi 5 mm. longae, spathulato-lineares, villosi, apice dilatato 1·5 mm. longo ovato subacuto villoso barbigero. *Stamina* sessilia 0·75 mm. longo ; antherae orbiculatae, apice glandulis globosis instructae. *Stylus* 5 mm. longus, linearis, supra curvus. *Stigma* 0·5 mm. longum, obovatum, facie tuberculo minuto instructum. *Ovarium* obovato-oblongum, dense pilosum. *Fructus* subpedicellatus, 4·5 mm. longus, ellipticus, subobtusus, pilosus.

South Africa. Cederberg, *Wallich*.

Described from a single specimen preserved in the Herbarium of the British Museum.

1159. **Struthiola Gilgiana**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 214, anglice [Thymelaeaceae] ; affinis *S. usambarensi*, Engl., a qua foliorum adultorum marginibus pilosis recedit.

Rami erecti, pubescentes, superne dense foliati. *Folia* verticillata, sessilia, lineari-lanceolata, acuta, 12 mm. longa, 2 mm. lata, marginibus sparse pilosis exceptis glabra. *Flores* foliis paullo breviores. *Bracteolae* lineari-oblongae, obtusae, conduplicatae, 4 mm. longae, in marginibus et apice pubescentes. *Calycis tubus* gracilis, circiter 8 mm. longus, glaber ; lobi lanceolati, acuti, 3 mm. longi, glabri. *Petala* ad basin divisa ; segmenta teretia, circiter 0·7 mm. longa, carnosa. *Stylus* 4–5 mm. longus.

Tropical Africa. German East Africa : Usambara, slopes of Mtai, *Holst*, 2476, partly (mixed with *S. ericina*, Gilg).

1160. **Struthiola Albersii**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 215, anglice [Thymelaeaceae] ; affinis *L. Thomsoni*, Oliv., a qua foliis patulis recedit.

Rami erecti, villosi, superne dense foliati. *Folia* verticillata, sessilia, lanceolata vel ovato-lanceolata, acuta vel subacuta, 8–15 mm. longa, 4–5 mm. lata, in marginibus reflexis et apice villosa, ceterum glabra. *Flores* folia aequantes, glabri. *Bracteolae* oblongae, obtusae, conduplicatae, 3 mm. longae, in marginibus et apice villosae. *Calycis tubus* gracilis, 8–12 mm. longus ; lobi ovato-lanceolati, acuti, duo exteriores tubi trientem aequantes, apice pilis brevibus rigidis muniti. *Petala* ad basin divisa ; segmenta teretia, circiter 0·7 mm. longa, carnosa. *Stylus* 4–5 mm. longus. *Fructus* ovoideus, acuminatus, circiter 2 mm. longus, glaber.

Tropical Africa. German East Africa : Usambara, Kwai, *Albers*, 191.

1161. **Gnidia Thomsoni**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 219, anglice [Thymelaeaceae]; affinis *G. huillensi*, Gilg, a qua foliis bracteisque valde acutis recedit.

Caules florentes erecti, graciles, ramosi, 15–22 cm. longi, glabri. *Folia* linearia, acuminata, acuta, 8–18 mm. longa, glabra. *Capitula* pedunculata, multiflora ; bracteae involucrantes 6–8, anthesi erectae, ellipticae, acuminatae, acutae, 8 mm. longae, tenues, coloratae, costa distincta. *Flores* tetrameri, minute pedicellati ; pedicellus apice sericeo-villosus. *Calycis tubus* circiter 12 mm. longus, infra articulationem glaberrimus, supra articulationem glandulosus, puberulus ; lobi elliptici, concavi, obtusi, apice leviter incurvo. *Petala* ad papillas graciles capitatas 0·5–1 mm. longas reducta. *Antherae* verticilli inferioris imperfectae. *Ovarium* glabrum.

Tropical Africa. German East Africa : lower plateau north of Lake Nyasa, *Thomson*.

1162. **Gnidia montana**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 221, anglice [Thymelaeaceae] ; bracteis coloratis, capitulis lateralibus pedunculatis, pedunculis erectis, foliis linearibus circiter 0·7 mm. latis distincta.

Caules florentes numerosi, erecti, pauciramosi, graciles, 22–30 cm. longi, glabri. *Folia* linearia, subacuta, 8–12 mm. longa, glabra. *Capitula* terminalia, pedunculata, multiflora ; bracteae involucrantes circiter 8, anthesi erectae, oblongae vel ellipticae, subacutae vel acutae, 6–8 mm. longae, 4–6 mm. latae, tenues, coloratae, costa valde distincta. *Flores* tetrameri, rarius pentameri, pedicellati ; pedicellus brevissimus, apice sericeo-villosus. *Calycis tubus* haud 12 mm. longus, infra articulationem glaberrimus, supra articulationem dense sericeo-pubescens ; lobi oblongi, apice rotundati, circiter 2 mm. longi, extus sericeo-pubescentes. *Petala* obcordata, circiter 0·5 mm. longa, crassa, lutea. *Ovarium* glabrum.

Tropical Africa. Abyssinia : Kambata, about 1800 m., *Wellby*.

1163. **Gnidia nutans**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.*, vol. vi., sect. 1, p. 221, anglice [Thymelaeaceae] ; capitulo nutante, calycis tubo sericeo-pubescente distincta.

Caules florentes erecti, laxe ramosi, glabri, ramis numerosis longis. *Folia* numerosa, congesta, breviter petiolata, lineari-elliptica vel lineari-lanceolata, obtusa, 1·8–3 cm. longa, 4–8 mm. lata. *Capitula* pedunculata, multiflora ; bracteae involucrantes 4–6, late ovatae vel suborbiculares, florum dimidium aequantes, scariosae, glabrae, exsiccando brunneae. *Flores* breviter pedicellati, tetrameri ; pedicelli apice pilis erectis albis barbati. *Calycis tubus* circiter 12 mm. longus, infra articulationem glaber, supra articulationem dense pubescens ; lobi oblongi, obtusi vel emarginati, circiter 2 mm. longi, subtus pubescentes. *Petala* ovata, obtusa, crassa, carnosa, circiter tertiam partem calycis loborum aequantia. *Ovarium* glabrescens.

Tropical Africa. Portuguese East Africa : mountains east of Lake Nyasa, *Johnson*. Nyasaland : between Kondowe and Karonga, 600–1800 m., *Whyte*, 330 ; Nyika Plateau, 1800–2100 m., *Whyte* ; South Nyika mountains, 1200–2100 m., *Whyte*.

1164. **Gnidia ramosa**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 225, anglice [Thymelaeaceae]; affinis *G. Goetzeanae*, Gilg, a qua foliis obtusis recedit.

Frutex erectus, circiter 1 m. altus, multiramosus, glaber, ramis gracilibus. *Folia* brevissime sed distincte petiolata, lineari-oblonga, apice obtusa vel rotundata, versus basin angustata, 12–16 mm. longa, 2–3 mm. lata. *Capitula* pedunculata, parva, pauciflora; bracteae involucrantes 5–6, ovatae, abrupte acuminatae, circiter 6 mm. longae. *Flores* pedicellati, tetrameri; pedicellus brevissimus, pubescens, apice pilis longis erectis barbatus. *Calycis tubus* 6 mm. longus (an adultus ?), pubescens; lobi oblongi, apice rotundati, circiter 0·7 mm. longi, extus pubescentes. *Petala* minuta, inferne cylindrica, superne capitata. *Ovarium* glabrum.

Tropical Africa. Nyasaland: between Kondowe and Karonga, 600–1800 m., *Whyte*; Tanganyika Plateau, at Fort Hill, 1000–1200 m., *Whyte*.

1165. **Lasiosiphon Kerstingii**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol. vi., sect. 1, p. 233, anglice [Thymelaeaceae]; affinis *L. Hoepfneriano*, Vatke, a quo foliis obtusis recedit.

Caules e rhizomate lignoso orti, circiter 22 cm. longi, tomentelli, versus apicem ramosi. *Folia* oblonga, obtusa, basin versus angustata, 1·8–2·5 cm. longa, 6 mm. lata, minute pubescentia. *Capitula* solitaria, terminalia, multiflora; pedunculus brevis, tomentosus; bracteae involucrantes circiter 8, anthesi erectae, oblongae, obtusae, florum $\frac{2}{3}$ aequantes. *Flores* in receptaculo claviformi villoso insidentes, pentameri, lutei. *Calycis tubus* 12–16 mm. longus, infra articulationem pilis fulvis dense sericeo-villosus, supra articulationem tomentosus; lobi late oblongi vel obovati, rotundati, 3 mm. longi, 2 mm. lati, extus sericeo-villosi. *Petala* linearia vel oblongo-linearia, integra vel plus minus bifida, tenuissima, calycis loborum circiter $\frac{2}{3}$ aequantia. *Discus* minutus. *Ovarium* pilis erectis dense sericeo-villosum. *Fructus* ignotus.

Tropical Africa. Togoland: Kirikiri, *Kersting*, 36.

1166. **Arthrosolen sphaerantha**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.*, vol vi., sect. 1, p. 235, anglice [Thymelaeaceae]; affinis *A. Poggei*, H. H. W. Pearson, a qua calycis tubo duplo longiore recedit.

Planta lignosa, circiter 0·5 m. alta, superne ramosa, glabra. *Folia* sparsa, sessilia, linearia, acuta, 8–18 mm. longa, 2 mm. lata. *Capitula* terminalia, multiflora; bracteae involucrantes circiter 10, biseriatae, ovatae, acuminatae, acutae, 12 mm. longae, 6 mm. latae, glabrae. *Flores* breviter pedicellati, tetrameri; pedicellus supra medium annulo pilorum munitus, pilis erectis albis sericeis. *Calycis tubus* 1·6 cm. longus, infra articulationem glaber, supra articulationem pubescens; lobi ovati, acuminati, acuti, circiter 3 mm. longi. *Ovarium* glabrum.

Tropical Africa. German East Africa: Uha; by the River Malagarazi, *Trotha*, 56.

1167. **Arthrosolen foliosa**, *H. H. W. Pearson in Dyer*, *Fl. Trop. Afr.* vol. vi. sect. 1, p. 237, anglice [Thymelaeaceae]; affinis *A. fulgenti*, H. H. W. Pearson, a qua bracteis involucrantibus flores aequantibus vel leviter superantibus recedit.

Caules florentes erecti, circiter 0·6–1 m. alti, ramis numerosis brevibus gracilibus foliosis. *Folia* linearia vel lineari-oblonga, obtusa vel subacuta, basin versus angustata, 2·5–3·8 cm. longa, glabra, venatione prominente. *Capitula* axillaria, pedunculata, circiter 12-flora; pedunculus 1·8–5 cm. longus, gracilis, plerumque aphyllus basi excepta; bracteae involucrantes 4, ellipticae vel elliptico-oblongae, apice rotundatae, in basin plus minus angustatae, membranaceae, haud coloratae, flores vix superantes, venis conspicuis. *Calycis tubus* 12–18 mm. longus, extus praecipue infra articulationem sericeo-villosus, intus glaber; lobi oblongi, obtusi, extus pubescentes, intus glabri. *Ovarium* glabrum.

Tropical Africa. Soudan: between Bammako and Guignula, *Chevalier*, 256.

1168. **Dicranolepis stenosiphon**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 240, anglice [Thymelaeaceae]; affinis *D. Schweinfurthii*, Gilg, a qua foliis subtus glabris vel glabriusculis differt.

Rami graciles, sparse pilosi. *Folia* breviter petiolata, rhomboidea vel oblique oblonga, caudato-acuminata, acuta vel obtusa, 5–8 cm. longa, 2·5–3·8 cm. lata, integra, glabra. *Flores* axillares, solitarii vel geminati, pentameri, 3·8–5 cm. longi. *Calycis tubus* gracilis, glaber vel sparse puberulus; lobi lanceolati, acuti, $\frac{1}{4}$ tubi aequantes, marginibus puberulis, venis parallelis. *Petala* dimidium calycis loborum superantia, ad basin divisa; segmenta 10, patentia, linearia, prope apicem plus minus incisa. *Ovarium* pilis paucis erectis prope apicem munitum, ceterum glabrum. *Fructus* (an maturus?) ovoideus, apiculatus, 8–12 mm. longus, glaber.

Tropical Africa. Cameroons: Bipinde, *Zenker*, 1277, 2762, 3026, 3655.

1169. **Dicranolepis glandulosa**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 242, anglice [Thymelaeaceae]; affinis *D. convallariodorae*, Gilg, a qua calycis tubo glanduloso differt.

Rami graciles, glabri. *Folia* sessilia, oblique oblonga, caudato-acuminata, obtusa, 10–19 cm. longa, 5–7·5 cm. lata, integra, supra glabra, subtus glabrescentia. *Flores* solitarii (?), sessiles, pentameri, 6·5–7·5 cm. longi, extus glandulis crassis pedicellatis dense vestiti. *Calycis tubus* latus; lobi ovati, obtusi, circiter 12 mm. longi. *Petala* ad basin divisa, calycis lobis duplo longiora, glabra; segmenta 10, oblonga vel anguste obovata, apice integra, rotundata, vel incisa. *Ovarium* glabrum; stylus gracilis, vix exsertus. *Fructus* globosus.

Tropical Africa. Cameroons: Batanga, *Dinklage*, 971; Bipinde, *Zenker*, 1951.

1170. **Dicranolepis polygaloides**, *Gilg ex H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 243, anglice [Thymelaeaceae]; affinis *D. laciniatae*, Gilg, a qua petalorum segmentis integris differt.

Rami primum dense pubescentes, demum glabri. *Folia* rhomboidea vel oblique ovata, acuminata, obtusa, 2·5–3·8 cm. longa, 1·2–1·8 cm. lata, integra, supra glabra vel glabriuscula, subtus pilis sparsis appressis; petioli brevissimi, dense pubescentes. *Flores* solitarii vel geminati, sessiles, pentameri, 3·2–3·8 cm. longi, dense pubescentes. *Calycis tubus* gracilis; lobi circiter $\frac{1}{4}$ tubi aequantes,

oblongo-ovati. *Petala* plerumque calycis lobos aequantia, ad basin divisa, glabra; segmenta linearia vel lineari-oblonga, integra. *Ovarium* glabrum. *Fructus* ignotus.

Tropical Africa. Cameroons: along the River Mungo, between Mundame and Otam, *Schlechter*, 12,889; North Cameroons, *Conrau*, 118.

The name *Dicranolepis polygaloides*, Gilg, first appeared, without description, in Schlechter, Westafr. Kautschuk-Exped. p. 301.

1171. **Dicranolepis pubescens**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 243, anglice [Thymelaeaceae]; affinis *D. laciniatae*, Gilg, a qua calycis tubo intus pubescente recedit.

Rami primum dense pubescentes, demum glabri. *Folia* rhomboidea vel oblique ovata, acuminata, obtusa, 5–6·3 cm. longa, 2–2·5 cm. lata, integra, supra glabra, subtus pilis sparsis appressis; petioli brevissimi, pubescentes. *Flores* axillares, solitarii, sessiles, nutantes, pentameri, 2·5–3·8 cm. longi, pubescentes. *Calycis tubus* supra apicem ovarii intus pubescens; lobi ovati, obtusi, 8–12 mm. longi, pubescentes, venis parallelis. *Petala* calycis lobos haud superantia, fere ad basin divisa, glabra; segmenta 10, oblonga, apice lato inciso. *Ovarium* glabrum. *Fructus* ignotus.

Tropical Africa. French Guinea: Kassa, north of Sierra Leone boundary, *Scott-Elliot*, 5066.

It has been found that the specimen referred to a new species of *Dicranolepis*, *D. parviflora*, H. H. W. Pearson in Dyer, Fl. Trop. Afr. vol. vi. sect. 1, p. 244 (1910), is identical with *D. Thonneri*, De Wild. et Th. Dur. in Comptes-rendus Soc. Bot. Belg. vol. xxxviii. p. 114 (1900), and Plantae Thonnerianae Congolenses, p. 29, t. 10.

1172. **Synaptolepis retusa**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 247, anglice [Thymelaeaceae]; calycis tubo e basi in apicem sensim ampliato, inflorescentia axillari, foliis haud ovatis distincta.

Frutex; ramis teretibus glabris, cortice rubello. *Folia* brevissime petiolata, elliptica, elliptico-oblonga vel obovata, retusa vel emarginata, interdum apiculata, basin versus angustata, 2·5–6·3 cm. longa, 1·2–2·5 cm. lata, coriacea, glabra, margine incrassato revoluto, supra glauca, subtus fulva, venatione subtus prominente. *Inflorescentiae* axillares, pauciflorae; flores breviter pedicellati; pedicelli laeves. *Calycis tubus* e basi leviter sensim ampliatus; lobi oblongi, obtusi, 2–4 mm. longi, glabri. *Fructus* ovoideus, 1·8 cm. longus (maturus ?), calycis tubo persistente coronatus.

Tropical Africa. French Guinea, *Farmar*.

1173. **Craterosiphon Soyauxii**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 248, anglice [Thymelaeaceae]; foliis basi rotundatis a *C. scandente*, Engl. & Gilg, differt.

Planta glabra. *Folia* opposita, breviter petiolata, ovata vel elliptica, longe acuminata, obtusa, basi rotundata, 6·3–7 cm. longa, 3·2–3·8 cm. lata, integra, supra exsiccando glauca, subtus brunnea, nervis distinctis patentibus parallelis. *Flores* non visi. *Fructus* ovoideus, 2·5–3·2 cm. longus, 1·8 cm. diametro, rugosus, endocarpio osseo.

Tropical Africa. Gaboon: Munda; Sibange Farm, *Soyaux*, 263.

1174. **Peddiea cyathulata**, *H. H. W. Pearson in Dyer, Fl. Trop. Afr.* vol. vi. sect. 1, p. 251, anglice [Thymelaeaceae]; affinis *P. Zenkeri*, Gilg, a qua stylo quam ovario longiore differt.

Folia brevissime petiolata, versus apices ramorum plus minusve congesta, elliptica vel elliptico-lanceolata, acuminata, obtusa, 7·5–10 cm. longa, 1·8–2·5 cm. lata, subcoriacea, glabra; nervi laterales patuli vel ascendentes, multiramosi, sat distincti. *Umbella* terminalis, 2–5-flora, glabra; pedunculus 0·2–1·2 cm. longus; bracteae caducae, oblongae, 4–6 mm. longae, in marginibus minute pubescentes. *Flores* tetrameri; pedicelli 0·6–1·2 cm. longi. *Calycis tubus* 6–8 mm. longus, longitudinaliter costatus, glaber, costis prominentibus; lobi anthesi erecti, oblongi vel triangulares, apice rotundati vel truncati, in marginibus dense pubescentes. *Antherae* breves, lineari-ovatae. *Discus hypogynus* $\frac{1}{3}$ ovarii aequans, cupularis, non lobatus, margine crenulato villoso. *Fructus* non visus.

Tropical Africa. Nyasaland: Mount Malosa, 1200–1800 m., *Whyte*.

1175. **Thesium Dinteri**, *A. W. Hill* [Santalaceae]; species pedicellis elongatis distincta *T. mukensi*, A. W. Hill, similis.

Suffrutex 30–60 cm. alti; caules numerosi, erecti, ramosi, robusti; rami patento-erecti, laxi, 24–30 cm. longi, sulcati, quadrangulares. *Folia* distantia 0·4–1·2 cm. longa, linearia, apice acuto decolorato paullo reflexo. *Inflorescentiae* laxae, pauciflorae. *Flores* singuli, longe pedicellati, in axillis bractearum dispositi, pedicellis 0·6–1·5 cm. longis; bracteae foliosae, pedicellis ex parte adnatae, linearilanceolatae, acutae, carinatae, 6–8 mm. longae; bracteolae 2, 3 mm. longae, floribus breviores. *Perianthium* 3 mm. longum, siccitate aurantiacum, segmentis 0·75 mm. longis lanceolatis obtusis coriaceis dorso conspicue carinatis cucullatis apice longe barbatis. *Filamenta* 0·5 mm. longa; antherae 0·7 mm. longae. *Stylus* 1 mm. longus; stigmate capitato. *Fructus* immaturus.

Tropical Africa. German South West Africa: Hereroland; Okaruse Kalk, *Dinter*, 641; Kl. Huis, near Neitsas, *Dinter*, 784.

1176. **Thesium megalocarpum**, *A. W. Hill* [Santalaceae]; species fructibus grandibus distincta, *T. Goetzeano*, Engl., paullo similis, *T. longirostri*, Schlechter, foliis marginibus serrulatis affinis.

Suffrutex perennis; caules lignosi, erecti, 30 cm. vel plures longi, versus basin suberosi, superne sulcati, plus minusve quadrangulares, glabri, multiramosi; rami erecti, tenues, sulcati, foliosi, 10–25 cm. alti. *Folia* circiter 1 cm. longa, lineari-lanceolata, acuta, carinata, plus minusve erecta, marginibus minute serrulatis. *Inflorescentia* racemosa, laxa, floribus singulis stipitatis axillaribus vel breviter pedicellatis; bracteae 0·8–1 cm. longae, floribus longiores, pedicellis brevissimis adnatae, lineari-lanceolatae, acutae, acute carinatae, marginibus minute serrulatis; bracteolae 2, floribus paullo breviores. *Perianthium* 3 mm. longum, segmentis 1·25 mm. longis lanceolatis subacutis cucullatis apice et ad margines barbatis. *Filamenta* 0·3 mm. longa; antherae 0·5 mm. longae. *Stylus* crassus, 1·5 mm. longus. *Fructus* globoso-ovoideus, 4–4·5 mm. longus, 3–3·5 mm. latus, costis 10 et reticulationibus distinctis, stipite crasso 3 mm. longo instructus.

Tropical Africa. German South West Africa: Hereroland; Waterbergplat, *Dinter*, 585; Otavi, *Dinter*, 726; Grootfontein, *Dinter*, 912.

1177. **Thesium xerophyticum**, *A. W. Hill*, [Santalaceae]; species inter eas bibracteolatas foliis reductis, caulibus foliis et floribus pilosis distincta.

Suffrutex perennis; caules lignosi, plus minusve erecti, 30 cm. vel plures longi, sulcati, minute pilosi, multiramosi: rami divaricati, 2–5 cm. longi, sulcati, minute pilosi. *Folia* numerosa, squamiformes, subulata vel late ovata, acuta, 1–2 mm. longa, apicibus fuscis. *Flores* sessiles in axillis bractearum dispositi; bracteae triangulari-ovatae, acutae, 1·5 mm. longae, minute pilosae, bracteolae 2, concavae, ut bracteae apicibus fuscis. *Perianthium* 1 mm. longum, segmentis 0·5 mm. longis ovatis cucullatis extra hirsutis marginibus sinuoso-undulatis inflexis apicibus fuscis. *Filamenta* 0·4 mm. longa; antherae 0·5 mm. longae. *Stylus* minutus. *Fructus* ovoideus, circiter 2·5 mm. longus, 2 mm. latus, minute pilosus, costis 10 conspicuis.

Tropical Africa. German South West Africa: Hereroland; Windhoek, *Dinter*, 270; Farm Hoffnung, 1900 m., *Dinter*, 964.

1178. **Alchornea glabrata**, *Prain* [Euphorbiaceae-Crotoneae]; species *A. floribundae*, Muell.-Arg., et *A. hirtellae*, Benth., valde affinis ab illa foliis minoribus ab hac capsulis haud verrucosis petiolisque haud hispidis differt.

Frutex vel interdum *arbor* 12 m. alta, ramulis minute pubescentibus vel puberulis. *Folia* breve petiolata, oblonga vel oblanceolato-oblonga, acuta, margine integra vel crenata, versus basin anguste truncatum vel cuneatum gradatim angustata, 10–15 cm. longa, 2·5–6 cm. lata, modice firma, utrinque glabra, nervis secundariis utrinque 6–8 subtus nervo centrali reticulationeque satis prominulis; petioli puberuli vel glabri, 5–6 mm. long; stipulae subulatae, 5–6 mm. longae. *Flores masculi* in spicas paniculatas terminales dispositi; rhachis gracilis puberula vel fere glabra; alabastra 1 mm. lata. *Flores feminei* in spicas simplices dispositi. *Capsula* 3-cocca, laevis, minute pubescens, 6 mm. diametro. *Styli* elongati, simplices.—*A. floribunda*, var. *glabrata*, Muell.-Arg. in Seem. Journ. Bot., 1864, p. 336, et in DC. Prodr. xv., pars 2, p. 905; Hiern Cat. Afr. Pl. Welw., pars iv., p. 976.

Tropical Africa. Nile Land: Juru, *Schweinfurth*, 3275. Angola: Pungo Andongo, *Welwitsch*, 352. German East Africa: Amani, *Zimmermann*, 93, 151, 880; Usambara, 1200 m., *Buchwald*, 247; Lutindi, *Liebusch*; Nquelo, 1000 m., *Scheffler*, 51; Kiriba Forest: North-East of Lake Tanganyika, 2100–2400 m., *Scott Elliot*, 8278, 8307; Rugege Forest, 1900 m., *Mildbraed*, 914; Kwidjivi Island in Lake Kiwa, 1600 m., *Mildbraed*, 1207.

Though referred by Mueller to *A. floribunda*, Muell. Arg., with which it agrees in having smooth fruits, it does not very strikingly resemble that species. It does, however, closely resemble and is evidently very nearly allied to *A. hirtella*, Benth., but differs in having smooth, not warted fruits, and is readily distinguished, in the absence of fruit, by the absence of hispid hairs on the mid-rib beneath and on the petioles.

1179. **Cleidion Preussii**, *Baker* [Euphorbiaceae-Crotoneae]; species *C. Mannii*, Baker, valde affinis floribus numerosioribus foliisque majoribus differt.

Frutex scandens, glabra. *Folia* distincte petiolata, ovata, 10–12 cm. longa, 5–6 cm. lata, acuminata, basi subrotundata, margine crenulata, membranacea, subnitida, utrinque glabra, 3-nervia, nervo centrali nervos secundarios arcuatos utrinque 2–3 emittentia; petioli glabri 4–5 cm. longi; stipulae minutae. *Racemi* masculi axillares breviter pedunculati, laxi, 10–15 cm. longi, ramulos breves patentes 2–4 mm. remotos 4–6 mm. longos plurifloros emittentes; pedicelli filiformes, flores excedentes; bracteae minutae, acutae, alabastra globosa, glabra, 1–5 mm. diametro. *Sepala* 3–5, glabra, subacuta. *Stamina* indefinita, filamentis brevibus receptaculo globoso insertis; antherae introrsae, 4-locellatae. *Flores* feminei ignoti.—*Mallotus Preussii*, Pax in Engl. Jahrb., xxiii., p. 525.

Tropical Africa. Cameroons: Barombi, *Preuss*, 420.

1180. **Necepsia**, *Prain*, gen. nov. [Euphorbiaceae-Crotoneae]; genus receptaculo masculo more plurium *Claoxylorum*, moreque *Argomuellerae* glanduligero, glandulis uti in illis piligeris sed densius, nec uti in hac nudis; a generibus ambobus forma insertioneque antherarum tamen distinctum.

Flores monoici, apetali. *Flores* ♂: *Calyx* ovoideo-globosus, segmentis 4 valvatis ascendentibus. *Stamina* numerosa; filamentis liberis receptaculo globoso tota superficie glandulis oblongis dense pilosis inter stamina sitis praedito inserta; antherae introrsae longitudinaliter connectivo latiusculo breviter ultra loculos producto affixae. *Ovarii rudimentum* 0. *Flores* ♀: *Sepala* 5, imbricata. *Discus* crassus, explanatus, margine minute crenulatus ibique glaber, superficie versus ovarium spectante quanta libera tanta setosa. *Ovarium* 3-loculare, dense setosum; styli 3, bifidi, crassi, subreflexi, basi brevissime connati, extra et prope basin intus pubescentes, superne intus prominenter fimbriato-papillosi; ovula in quoque loculo solitaria.—*Arbor*. *Folia* alterna, petiolata, minute remote dentata. *Flores* in spicis axillaribus androgynis vel 1-sexualibus dispositi; masculi plures femineo solitario centrali addito vel deficiente glomerati, vel feminei solitarii pluri-bracteati; bracteae rigidae, striatae, subscariosae.

N. Afzelii, *Prain* (species unica).

Arbor, innovationibus parce puberulis mox glabrescentibus. *Folia* breve petiolata, oblongo-ovata vel ovata, acute acuminata, apice mucronulata, minute remoteque dentata, basi late cuneata ibique subtus prope apicem petioli 2-glandulosa; 10–25 cm. longa, 6·5–9 cm. lata; utrinque glabra, siccitate brunnescentia; nervi laterales utrinque 7–8, ascendentes, nervuli subparalleles, ambobus nervoque centrali subtus prominentibus, nervis centrali lateralibusque etiam supra prominulis; petiolus 1–2·5 cm. longus, supra canaliculatus, glaber; stipulae lanceolatae, rigidae, subscariosae, persistentes, 6 mm. longae. *Spicae* solitariae, axillares, 10–25 cm. longae; rhachis angulata, rigida, fusco-puberula; bracteae glomeratae, dense imbricatae, ovatae, acutae, rigidae, striatae, subscariosae, pubescentes, 2–4 mm. longae; glomeruli flores masculos plures femineo singulo centrali addito, nunc flores masculos plures tantum, nunc florem singulum

femineum includentes. ♂ *Alabastra* ovata, demum ovoideo-globosa subacuta. *Calycis* segmenta 4, valvata, extra puberula ; pedicelli puberuli, 2 mm. longi. *Petala* 0. *Stamina* circa 30 ; filamenta libera receptaculo subgloboso affixa glandulis oblongis dense pubescentibus intermixta ; antherae introrsae, 2-loculares ; loculi ovati connectivo latiusculo breviter producto parum sejuncti. ♀ *Alabastra* globosa. *Sepala* 5, triangularia ovatave, acuta, puberula, imbricata. *Discus* crassus, explanatus, margine crenulato glaber, supra ubi ab ovario liber dense setosus. *Ovarium* 3-loculare, dense fusco-setosum, loculis 1-ovulatis ; styli basi minopere connati, subreflexi, 2-fidi, extra fusco-pubescentes ; intus versus basin pubescentes superne stigmatici, fimbriato-papillosi.

Tropical Africa. Sierra Leone, *Afzelius*, 29 ; Cameroons : Bipinde, *Zenker*, 3040.

L.—AGAVE LURIDA.

J. R. Drummond.

One of the most interesting of the *Agaveae* that have flowered at Kew during this year and the last is the tall *Euagave* that "poled" in the Succulent House in the past summer, which is a good example of the species described by W. Aiton in the first edition of the Hortus Kewensis, vol. i., p. 472 (1789), as variety 'beta' of his *A. lurida*. For his 'alpha' variety, which differed from 'beta' by the proportionately greater breadth of its leaf, he cited Philip Miller's *A. Vera-Cruz*, which was correct—while for 'beta' he gave a double synonym, viz., "*A. rigida*, Mill. Dict.," and again, "Mill. Dict. edit. i. Aloe 4," the latter being pretty certainly right. The identification with the *A. rigida* of the Gardeners' Dictionary, on the other hand, presents serious difficulties. Tradition early pointed to the species which has just flowered at Kew as Miller's *rigida*, but this cannot be reconciled with Miller's own very clear description of the leaves as "entire," that is, presumably, without indentation or prickles. Again, "*A. rigida*" is often applied, following a guess of Engelmann's, to one or more of the plants from which the "Sisal hemp" of commerce purports to be derived, and in a recent publication (Miss. Bot. Gard. Rep., xix., pp. 273–287) Dr. Trelease has put forward a very able and elaborate plea in support of this usage ; but the present writer cannot escape the circumstance—first pointed out by Col. Prain—that at all events the "Bahama Hemp" (*A. sisalana*, Perrine), cannot possibly be identified with Miller's *rigida*, of which he wrote, "*this sort never puts out suckers from the root, nor have I seen any plant of this kind in flower, although there are many of them in the English Gardens, some of which are of considerable age.*" Now the "Bahama Hemp" (*A. sisalana*, Perrine), sends up suckers freely and continuously, while the chief plantation Agave of Yucatan is ordinarily propagated in the same way as Perrine's species ; the planter's object being to keep his plant from "poling" as long as he can, he naturally cultivates those kinds that yield offsets freely.

When Dr. Trelease's memoir was written, as well as that on the Furcraeas, by the present writer in the eighteenth Report of the Missouri Botanical Garden (1907, pp. 25–75), an essential key to the earlier history of this group of Euagaves was wanting, which has been in great part supplied by the flowering of *A. lurida*, and the remarks at p. 61 of the *Furcraea* article, so far as they suggest that the "*A. mexicana*" of Desfontaines' may have been identical with the *A. Vera-Cruz* of Miller, must now be modified, if, as is probable, Desfontaines' "*mexicana*" was the plant still cultivated under this name in Portugal and Italy, because there is good herbarium material at Kew which proves that the "*A. mexicana*" grown in the Coimbra Garden, as well as that which flowered in Baron Ricasoli's experimental garden in Tuscany in 1882 (see Gard. Chron. n.s. xix. [1883] p. 142, fig. 22), belonged to the same species as the plant received from Messrs. Sander as "*A. mexicana*," which has lately flowered at Kew, and is, without question, that depicted at t. 1522 of the Botanical Magazine (1813) as one variety of Aiton's "*lurida*." We can now follow with some confidence the steps in the introduction of these large Euagaves into European countries. The first to arrive, and the only one that seems to have established itself on any scale as a denizen of Europe, is the species often, if not usually, called "*A. americana*" in Southern Europe, but properly styled *A. Vera-Cruz*, Ph. Miller (Gard. Dict. ed. viii.). This is at home in parts of Asia and Africa as well, and has been worked up for its fibre, which is far from the best of its class, by market report, and is chiefly used, probably—like that of *A. Cantala* in India for example—as an admixture with superior staples such as *A. sisalana* or certain Furcraeas. This was "Aloe 4" of the 1st edition of the Gardeners' Dictionary, and, as *A. Vera-Cruz* of Miller, is duly cited for the broad-leaved form of his own *A. lurida* by Aiton, who, had he followed his own judgment, would most likely not have placed it under the same species as his true *lurida*. The differences between the two forms are both striking and essential, but depend on features which the Linnaean canons led contemporary students to regard as inadequate for specific diagnosis. To anyone who has seen *A. Vera-Cruz* poling in the open there can be no difficulty in distinguishing *A. lurida*, though the general plan of the inflorescence—the very long filaments forming a sort of tuft or plume above the germen—and other characters are almost identical; the remarkable green perianth of *lurida*, however, marks it off immediately. The best means of distinction is to be found, as the Hortus Kewensis has indicated, in the outline and proportional dimensions of the leaf: in *A. Vera-Cruz* the blade is broader in proportion to the 'neck' than in *A. lurida*, and it must be remembered that although, in all the *Agaveae*, surrounding conditions, more particularly if induced by cultivation, do undoubtedly affect the absolute size and development of the vegetative organs—yet the proportions of the leaf, also the plan of the inflorescence, and the relative features of the floral parts are found, from study, to be very constant.

The prickles on the margin of the leaf in *A. lurida* are almost garnet-coloured when young, turning deep chestnut in age; in *A. Vera-Cruz* they are chestnut when young, turning when old a

deep shiny black, as duly noted by Philip Miller; further, in *A. lurida* they are about half the size of the side prickles of *A. Vera-Cruz* if compared at the same stage of development.

The next species that was brought to Europe seems to have been the true *A. americana* of Linné (Sp. Pl., ed. i., vol. i., p. 323), which is figured in Andrews' Repository, vii., t. 433 (numbered by an error "438"). In Bot. Mag., t. 3654, there is a good representation of the variegated form of this species which is that most commonly in cultivation. This is a hardier kind than *A. Vera-Cruz*, though specimens of both, and of yet another species, live through the summer outside the Temperate House at Kew; *A. americana* has flowered in the open as far north as Aberdeenshire and in Sweden. In the south of England it is nearly if not quite hardy. *A. lurida* on the contrary seems not to endure the climate of any part of these islands.

The third species just mentioned is perhaps the comparatively rare *Euagave* described by Miller at p. 148 of his "*Figures*" (and depicted in plate ccxxii.), which was possibly the "*A. Virginia*" of the 8th edition of the Gardeners' Dictionary, and is certainly *A. Milleri* of Haworth (Synopsis, p. 71). This is very easily mistaken, when not flowering, for *A. americana*, but the comparatively narrow end-spine marks it sufficiently; the leaf moreover has a different tint from that of *A. americana*.

The native homes of *A. americana*, *A. Milleri* and *A. lurida* are quite unknown; that of *A. Vera-Cruz* is probably to be sought on the eastern scarp of Central America. It seems not impossible that it may be the *Zapupe silvestre* of the tract between Vera-Cruz and Tampico (see Trelease, in Trans. Ac. St. Louis, xviii., p. 34, under *A. aboriginum*). Another species, which was early brought to Holland from the West Indies and well known to botanists and horticulturists of the 17th and 18th centuries as "*Aloe sobolifera*," was for a long time lost to science, but it is very probably the common species of Jamaica brought to notice by Sir Daniel Morris, and now represented in the Succulent House at Kew under the name of *A. Morrisii*, doubtfully distinct from the *A. Antillarum* of Descourtilz (Fl. Ant., iv. p. 239, t. 284). This species belongs to a group readily distinguished by the bright yellow colour of the blossoms; the leaves of *A. Morrisii* have a different consistency from those of the *americana* group, while the side prickles are comparatively minute and set far more closely.

It should here be noted perhaps that the real *A. americana* has no merits whatever except horticulturally. Its fibre is wretched; its juice does *not* form a substitute for soap, and it is emphatically *not* the plant from which the "Pulque" of Central America is extracted. A fine example of one of the chief Pulque-producing species is to be seen near the west entrance of the Succulent House at Kew, labelled *A. atrovirens*; it has recently transpired that this may not be true *atrovirens* of Karwinski, and it should perhaps be named *A. cochlearis*, Jacobi.

The true *lurida* of Aiton (as distinguished from the *Vera-Cruz* of Miller, which he was unfortunately led to bracket with it as a "variety" of one species) seems to flower less readily than any of

its allies in European collections. The writer has been able to authenticate only the following :—

(i.) 1811, Royal Gardens, Kew ; see Bot. Mag., t. 1522 :

(ii.) 1881 (January), Coimbra Gardens, Portugal ; see specimens, drawing, and note, communicated by Dr. Henriques, in Herb. Kew :

(iii.) 1882, Experimental Garden, Port Ercole, Argentario Promontory, Tuscany ; see specimens communicated by Baron Ricasoli in Herb. Kew, also his note in Gard. Chron., n.s. xix. (1883), p. 142, fig. 22.

The plant which flowered with Saunders about 1873 (see *Refugium*, t. 307) does not seem from Mr. Baker's description to have been Aiton's *lurida*. It was more probably *A. Jacquiniana*, Hook. (in Bot. Mag., t. 5097). In the Herbarium of the British Museum there is a sheet with three flowers on it which are referable perhaps to *A. lurida*, and on this is a note by one of Banks' staff that the specimens came from Ball's Pond (near Stoke Newington), and this would not improbably indicate an even earlier example than that at Kew of 1811. But on the same sheet there are other fragments that seem to belong to a different species, and besides this there exists yet another *Agave* which, though otherwise conspicuously distinct, has a perianth rather nearly resembling that of the true *lurida*. This species has indeed been taken for "*A. lurida*, var. *Jacquiniana*" (i.e., *A. Jacquiniana*, Schultes ex Hooker), but is probably = *A. miradorensis* of Jacobi in Abh. Schles. Ges., 1869, p. 156, which again it is difficult to separate by the description from the earlier *A. Desmettiana* of the same author (Versuch., p. 241).

A drawing was made from the living specimen of 1811 by a contemporary artist, who for some inscrutable reason drew the leaf tip as if it had no terminal spine, and this error, together with the peculiar colouring, has attached a shade of doubt to the illustration, which has now been dispelled by the flowering of the modern example, for the inflorescence proves to have been faithfully depicted. About two years later this drawing was submitted to Gawler, who learned from the younger Aiton that it was the *A. lurida* of his father and predecessor. Unluckily Gawler did not grasp the essential circumstance that Aiton's *lurida* was horticulturally and, as it now proves, correctly limited to the so-called variety ('beta') of the 1st edition of the Hortus Kewensis, the ('alpha') variety being Miller's *A. Vera-Cruz*, with which as Miller's pupil he was doubtless thoroughly acquainted. As a consequence, while Gawler was at due pains to correct a mistake which had been copied from Willdenow (Sp. Plant., ii. p. 193) into the 2nd edition of the Hortus Kewensis, namely the identification of *A. lurida* of Aiton with the *A. lurida* of Jacquin (Collect., iv. p. 94, t. 1, publ. 1790), he opened the door for a fresh troop of errors by identifying the plant of the Botanical Magazine figure with the 'alpha' variety of the elder Aiton, which, as we now clearly understand, is the quite distinct, though closely allied species, *A. Vera-Cruz* of Philip Miller. In the 19th Report of the Missouri Botanical Garden (pp. 279–287), Trelease has cleared up the

history of the *A. lurida* of Jacquin, and there can be no doubt, in view of the facts and arguments he has there marshalled, that Jacquin's plant was the same as that widely naturalized in the East Indies, for which the name of *A. Wightii* was proposed in Bengal Agricultural Bulletin, No. 8, 1905, by Col. Prain and the writer, and also with the *A. Jacquiniana* of Sir William Hooker in Bot. Mag., t. 5097 (1859).

Dr. Trelease carries his revision a step farther, and refers this well-marked species to the *A. angustifolia* of Haworth (Syn. 72); but for reasons that need not be detailed on this occasion the writer recommends that Jacquin's misnomer for this "Bastard Aloe" ("*A. vivipara*" of several authors) be replaced by the title of *A. Jacquiniana*, Schultes ex Hooker in Bot. Mag., t. 5097 (1859). The full description of *A. lurida*, Aiton, is held over till the plant, as it is hoped it will, may ripen capsules; the detailed synonymy of course awaits the description. It should be explained, however, why the use of *A. mexicana* for *A. lurida*, 'beta,' of Aiton is not here adopted in spite of its evidently general acceptance on the Continent of Europe. The original *A. mexicana* of Poiret, Suppl. i. p. 241 (1810), in so far as it was anything, related not to any Agave at all, but to *Furcraea cubensis*, Ventenat (see Miss. Bot. Gard. Rep., xviii., pp. 61–62, also earlier remarks by Fürst zu Salm. Dyck in Bonplandia, 1859, p. 88). It is now impossible to say what the original *A. mexicana* of the Jardin du Roi actually was, though it was most likely either *A. Vera-Cruz*, Miller, or *A. lurida* of Aiton (i.e., the true 'beta,' not the 'alpha' variety). Haworth's description of *A. mexicana* (Suppl. 41), inadequate as it may be, probably refers to the same species as Aiton's *lurida* ('beta'), but unless we are to throw over *lurida* altogether, Aiton's name has priority, for the Supplement appeared more than 20 years after the first edition of the Hortus Kewensis.

A key to the identification of the chief species mentioned in this note is appended.

Key.

Leaf-margin without prickles, finely serrulate... *miradorensis*, Jacobi
Leaf-margin furnished with prickles—
  Prickles inconspicuous; perianth bright yellow... *Morrisii*, Baker
  Prickles conspicuous; perianth green, or tinged with dull yellow—
    Leaves in a dense globose rosette, never exceeding 3 feet in length ... ... *Jacquiniana*, Schultes ex Hooker
    Leaves in a lax rosette, or tufted, always when mature exceeding 3 feet in length—
      Leaves hardly widened at the middle, very narrow in proportion to their length ... ... *Cantala*, Roxb.
Leaves obviously widened at the middle—
  Leaves ascending sharply from their bases; perianth-lobes narrowly ligulate, more or less constricted below their tips—
    Trunk inconspicuous; leaves tufted ... *sisalana*, Perrine
    Trunk ultimately attaining 5 feet in length; leaves arranged in a spiral rosette ... *longifolia*, Engelmann

Leaves decurved, or spreading at their bases; perianth-lobes ovate lanceolate, not constricted below their tips—
Leaves concave upwards, very fleshy up to their apical third ... ... *cochlearis*, Jacobi
Leaves not concave or fleshy in their apical third—
Leaves oblong-lanceolate in outline, neck manifestly constricted—
Terminal spine stout, markedly decurrent; leaves dull green (or striped with yellow)
americana, Linn.
Terminal spine comparatively slender, hardly decurrent; leaves a brighter green
Milleri, Haworth
Leaves oblong-linear in outline, hardly constricted at the neck—
Perianth lobes pale amber-coloured upwards; leaf tips ultimately revolute... *Vera-Cruz*, Ph. Miller
Perianth lobes green throughout; leaf tips erect, rigid ... ... *lurida*, Aiton

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LI.—MISCELLANEOUS NOTES.

Mr. W. J. Tutcher, whose appointment as Assistant Superintendent in the Botanic and Forestry Department, Hong Kong, was recorded in *K.B.* 1891, p. 245, has been appointed Superintendent of the Department in succession to Mr. S. T. Dunn, resigned.

Dr. Melchior Treub.—The death of this distinguished botanist, which took place at Saint Raphaël, near Cannes, on October 3, 1910, deprives Kew of a warm and constant friend.

Treub was born at Voorschoten, in Holland, on December 26, 1851. He entered the University of Leiden in 1869 and became assistant in the Botanical Institute there in 1874. In November, 1880, on the death of Dr. R. H. C. C. Scheffer, he was appointed Director of the Botanic Garden at Buitenzorg, in Java. During his tenure of this important post Treub was able to do much to increase its reputation and enhance its value. When he arrived in Java he found a well-furnished garden at Buitenzorg itself with a herbarium attached dating from the commencement of the establishment, and an annexe in the shape of a mountain garden at Tjiboddas established under the directorship of Teijsmann; also a museum and an experimental station organised by his immediate predecessor. To these he was soon able to add a series of well equipped laboratories for the prosecution of pharmacological, chemical, and physiological research, and to provide a special laboratory reserved for the use of foreign botanical investigators.

Under his guidance Buitenzorg soon became the leading centre of research connected with tropical agriculture, and the chief value of the help he has thus been able to afford to agricultural and other

cognate practical studies has been due to the fact that the results obtained by those working under him have depended directly on scientific investigation. The mass of administrative work involved in the supervision of so many and such varied activities, in place of impeding, appeared only to whet his own interest in scientific botanical studies, the results of which found a medium for publication in the Annals of the Buitenzorg Garden founded by Scheffer, and edited, from the second volume onwards, by Treub.

These studies have been of the most varied character and have been marked by the same wide interest that is reflected in his administrative work and in the practical investigations entrusted to his officers. His papers on morphological, embryological, physiological and phytogeographical subjects are characterised by a soundness of judgment and by a lucidity of treatment and perfection of style which fix the attention of the reader. He has touched on no subject which he has not illuminated, and his place as an investigator and expositor will be hard to fill. The value of his contributions to natural knowledge was very generally recognised; he was a corresponding member of the French and of the Bavarian Academies, and a foreign member of the Royal and Linnean Societies of London, and the recipient in 1907 of the Linnean Medal of the last-named body.

Towards the end of his career in Java his work of organization was crowned by the establishment in that island of a scientific Department of Agriculture, whereof the establishment at Buitenzorg forms an integral part, of which Treub was appointed the chief. While prosecuting the preliminary enquiries necessary in connection with this important change, Treub paid a visit to Manila where he contracted an illness the effects of which he did not speedily shake off. Shortly after his return to Buitenzorg he was compelled to take a somewhat prolonged leave of absence, which he spent in the mountains of Java. His health became sufficiently restored to admit of his resuming his duties, but about a year ago it again became so indifferent as to necessitate his resignation of office. He had intended to settle on the Riviera, but the state of his health necessitated his wintering in Egypt, and he did not reach Saint Raphaël, where he died, until spring.

Dr. Theodore Cooke.—A warm friend of Kew and one who had gained the sincere regard and affection of the members of the staff of the institution, has been lost to us in the person of Dr. Theodore Cooke, whose death occurred at his residence, Portswood House, Kew Gardens Road, on Saturday, November 5, 1910.

Dr. Cooke, who was in his 75th year, was born at Tramore, Co. Waterford, in 1836. He was the eldest son of the Rev. J. Cooke, M.A., formerly rector of Ardfinan, Co. Tipperary. Entering Trinity College, Dublin, he graduated in 1859, being Hebrew Prizeman, first Honoursman, and Senior Moderator and Gold Medallist in Experimental and Natural Sciences in the University, and obtaining special certificates in Mechanics and Experimental Physics, Chemistry, Mineralogy, Mining and Geology in the Engineering School. Destined originally for the profession of civil

engineer, Cooke went to India in 1860 as an engineer in the service of the Bombay, Baroda and Central India Railway, then under construction ; while in the service of this corporation he had charge of the building of the great iron bridge at Bassein, over 4000 feet long, which carries the line northwards to Surat. The work of the talented and versatile young engineer attracted the attention of Government, and in 1865 he was chosen to fill the important post of Principal of the Civil Engineering College at Poona. This college, with widened scope, developed into the Poona College of Science, and the principalship was held by Cooke with all the success that his wide and varied knowledge, his unvarying tact, and his administrative skill had led Government to anticipate until he retired from India in 1893. His knowledge and experience were during the 28 years of his tenure of this post utilised by Government in other directions ; on three occasions he was appointed to act as Director of Public Instruction, on another he acted as Director of Land Records and Agriculture in the Presidency. He was also appointed by Government a Fellow of the University of Bombay, in whose fortunes he took a keen interest, serving for a time as Dean of Faculty and as a member of the Syndicate. Throughout his service in India Cooke was keenly interested in botanical studies and one of his chief recreations was botanical field work. To this occupation of his leisure hours he brought the thoroughness and care which characterised the performance of his official duties, so that he became in time a recognised authority on critical points connected with the identity and distribution of the plants of the Bombay Presidency and Scinde ; it was therefore a particularly appropriate recognition of this fact that, in 1891, when the Botanical Survey of India was created by the linking up of the various botanical officers in the empire, the Bombay Government, who had no official botanist on their establishment, should have entrusted to Cooke's charge botanical survey operations in Western India. Shortly after his assumption of this duty, Cooke submitted a proposal which received the cordial support of the late Sir George King, then Director of the Survey, to undertake the preparation of a local *Flora of the Presidency of Bombay*. This proposal failed at the time to meet the approval of the Secretary of State for India, and when Cooke left India in 1893 his energies found an outlet in an appointment he was asked to accept at the Imperial Institute. After filling this post for three years he left London and settled in the West of England. The desire to prepare a Bombay Flora, though deferred had not, however, been abandoned, and in 1898, Cooke resubmitted the original proposal which on this occasion met with the approval of the Secretary of State. When Cooke assumed charge of the Botanical Survey of Western India in 1891, he placed a moiety of his magnificent private collection in the Herbarium of the College of Science at Poona, retaining the other moiety as a working set to be used in the preparation of the Flora. This personal set he took with him to England, and when his employment as author of the Flora was sanctioned he brought his specimens with him to Kew, where he took up permanent residence in order that he might carry out the work in the Herbarium there.

Once begun, the work, which in its complete form consists of two volumes containing eight parts, proceeded without a break. The first part was published in 1901, the eighth and concluding part appeared in 1908. Cooke applied to the task of its preparation all the precision and method characteristic of his official work. Every previous statement was subjected by him to careful personal verification ; the descriptions and the keys provided are models of lucidity and conciseness, and the work, which is a safe guide to the identity of the plants of the area with which it deals, has ensured for Cooke an honoured place in the roll of Indian botanists. While the work was in progress a serious fire completely destroyed the Poona Herbarium, and, with much public spirit, Cooke, as he completed the various parts of his *Flora*, despatched to India the material on which he had worked to replace the moiety of his collection which had been lost through this fire. When the Bombay Flora was finished Cooke lent his services as a volunteer to the task of assisting Sir W. T. Thiselton-Dyer in the preparation of the great *Flora Capensis*. He was engaged in this when overtaken by the illness whose fatal termination we now deplore.

A man of wide interests and of varied and accurate information, Cooke nevertheless did not allow himself to deviate from the work which he, for the time being, had in hand. To this capacity for steady application to the business immediately before him his success in all that he undertook was very largely due. An M.A. and a Master of Engineering of his University in ordinary course, his attainments were further recognised by his alma mater by the conferment of the degree of LL.D. ; his administrative gifts were recognised by Government in 1891 when he was created a C.I.E. A member of the Institute of Civil Engineers, Ireland, he was also a member of the Anthropological Institute of Great Britain and a Fellow of the Geological and the Linnean Societies.

Eucryphia pinnatifolia, *Gay*.—Among the hardier small trees and shrubs from South America this is decidedly one of the most attractive, yet it still remains, although introduced about 1862, one of the rarest in gardens. For this scarcity one must find some other cause than lack of hardiness, for the original tree in the Coombe Wood Nursery has withstood uninjured the frosts of over 40 years, including those of February, 1895. For several years there was a group of plants in a bed on the lawn near the Cactus House at Kew which grew and flowered well until they were 4 or 5 feet high ; they then commenced to die off one by one for no perceptible reason until none remained. Others planted in the collection of Rosaceae near the Pagoda behaved in a similar way. It was thought that their early death might be due to intense summer heat and dryness, which appear to have a peculiarly burning effect on much of the outdoor exotic vegetation at Kew, especially that from regions where the climatic conditions are moist and equable. To counteract this in the case of the Eucryphia, several plants were put out in a mass of *Erica mediterranea*, where the heaths grow close enough together to shade the soil and keep it permanently cool. In this position not one of the Eucryphias has

died, and the largest of them are now 8 feet high and in perfect health. Several flowered profusely last July and August—a season of blossoming which adds much to the garden value of any shrub, especially one whose beauty is as marked as that of this *Eucryphia*. The soil is the ordinary sandy loam of Kew to which peat and decayed leaves have been added. W. J. B.

Presentations to Museums.—The following miscellaneous specimens have recently been received :—

Mr. John Christie, of Messrs. Ide and Christie, Mark Lane, E.C. —Portions of plant of *Posidonia australis*, photo-micrographs of fibre obtained from same, also three photo-micrographs of infusorial earth and of a transverse section of a leaf of *Posidonia Caulinii*.

Bull Wharf, Ltd., Queenhithe, London, E.C.—A series of views illustrating the rubber industry in this country.

Sir Thomas H. Elliott, K.C.B.—Series of models of agricultural implements used in Japan.

Mr. P. G. Chapman, London Road, Kingston-on-Thames.—Seven tobacco pipes, including two from Uganda, and a series of views to illustrate the preparation of plug tobacco, by sailors.

Messrs. Bult Bros., Billiter Street, London, E.C.—Implements used in the collection of rubber.

Messrs. Stafford Allen & Sons, Ltd.—A collection of drugs prepared from home-grown plants and a series of photographs illustrating the cultivation of medicinal and perfume plants on their farms at Long Melford, Suffolk.

Provincial Forest Officer, Oloke Meji, Southern Nigeria.—Roots of "Ahun" or "Awan" (*Alstonia congensis*) and of "Aforo-Afe" (*Trema africana*). Fruits of "Egusi-Bara" (*Citrullus vulgaris*) and of "Egusi-Ito" (*Adenopus breviflorus*); the seeds yielded by these fruits are employed as food by the natives.

Director of Agriculture, Aburi, Gold Coast.—Photographic views of the agricultural stations and rubber plantations at Aburi and Tarquah.

Director, Royal Botanic Gardens, Kew.—Saki cup of Japan lacquer.

Assistant Director, Royal Botanic Gardens, Kew.—Series of photographs taken by the donor during a recent tour in Algeria and Morocco.

Mr. Reginald Tower, C.V.O., British Legation, Mexico.—A quantity of the wood of Lignum nephriticum (*Eysenhardtia amorphoides*); also pods of "Cascalote," apparently identical with "Divi Divi" (*Caesalpinia coriaria*), a well-known tanning material.

Superintendent of Forests, Entebbe, Uganda.—Two pieces of the wood of *Balanites Wilsoniana*, collected by the donor in the Bodongo Forest.

Mr. Anthony Waterer, Knaphill Nursery, Woking.—Two sections of the trunk of *Fagus betuloides*.

Right Honourable the Earl of Yarborough, Brocklesby Park, Lincolnshire.—A valuable collection consisting of 79 planks of home-grown timber.

Right Honourable the Earl of Derby, Knowsley, Prescot.—Planks of alder, willow, poplar, sycamore, section of stem of *Rhododendron ponticum*, and two sections of a burr of Turkey oak.

Right Honourable the Earl Beauchamp, Madresfield Court, Malvern.—Ten planks of various timbers, including *Sequoia gigantea*, *Taxus baccata*, *Cupressus Lawsoniana*, together with abnormal growths of larch, Scots pine, hazel, blackthorn, oak, lime, and maple.

Sir Edmund Loder, Bart., Leonardslee, Horsham.—Trunk of a diseased larch.

The Stanley Underwood Co., Lynchmere Farm, Haslemere.—Specimens to illustrate the application of the timber of sweet chestnut for fencing.

Messrs. William Hunt & Sons, The Brades Ltd., Brades Steel Works, near Birmingham.—A collection of tools connected with forestry operations.

J. M. H.

Botanical Magazine for November.—The plants figured are *Xeronema Moorii*, Brongn. et Gris (t. 8342) ; *Pleiocarpa mutica*, Benth. (t. 8343) ; *Columnea Oerstediana*, Klotzsch ex Oerst. (t. 8344) ; *Pyracantha angustifolia*, C. K. Schneider (t. 8345) ; *Houlletia Sanderi*, Rolfe (t. 8346).

The *Xeronema* is a striking plant from the mountains of New Caledonia at elevations of from 3000–5000 feet. It was introduced to European cultivation as long ago as 1875 by Mr. J. Linden, but the subject of the illustration was acquired for Kew in 1896 from Messrs. J. Veitch & Sons. *Pleiocarpa mutica* is a beautiful white-flowered stove shrub of this endemic Tropical African genus. This species was discovered by Mr. G. Mann in the Cameroons, and has since been found in Calabar. It is a somewhat aberrant member of the *Apocynaceae* and also of the genus in possessing five carpels—a peculiarity it shares with *P. rostrata*, Benth. The other species of the genus, excepting *P. salicifolia*, Stapf, with three or four carpels, have only the two carpels characteristic of the order. The Kew plant was raised from a cutting received in 1902 from the Glasgow Botanic Garden. The *Columnea* was discovered in Costa Rica 50 years ago, and does not appear to have been collected since then. The plant illustrated flowered in February last in the collection of Col. R. H. Beddome, Sispara, West Hill, Putney. Owing to the pendent habit of the branches and the bright scarlet flowers, this species forms an effective basket plant and bears considerable resemblance to some of the tropical species of *Aeschynanthus*. The Chinese thorn, *Pyracantha angustifolia*, discovered by Delavay in Yunnan in 1882, has afforded an opportunity of settling the vexed question of the taxonomy of the Chinese, European everlasting, and white thorn of Nepal. The everlasting thorn, or Buisson Ardent, is now universally known as Pyracantha, and it is fortunate that it has been found possible to maintain *Pyracantha* as the generic name for these three thorns. *P. angustifolia* was introduced to cultivation by Soulié, who sent seeds to Mr. M. L. de Vilmorin from

Eastern Tibet in 1895, and in 1899 seeds were sent to Kew by Lieut. Jones from Western China. The plant is not perfectly hardy at Kew, but flourishes in the warmer parts of England, and the subject of the illustration was received from Lieut.-Col. D. D. Cunningham, Tormount, Torquay, in whose garden the berries develop their beautiful orange colour. *Houlletia Sanderi* is the fourth species of the genus to be figured in the Magazine. This species was imported from Peru by Messrs. Sander & Sons, St. Albans, and the specimen figured was the first to flower in Europe, material being sent from the nursery of Messrs. Sander & Sons at Bruges. *H. Sanderi* is most nearly allied to *H. Lowiana*, Reichb. f., from Colombia.

Sugar Cane Wax.—We are indebted to Professor G. Barger, Professor of Chemistry at the East London College, for the following review of Mr. A. Wijnberg's recent book in Dutch on "The Wax of the Sugar-cane, and the Possibility of its Technical Production," * which has been presented to Kew by Professor G. van Iterson, of Delft.

The book under review is a dissertation from the newly founded botanical laboratory (Prof. G. van Iterson) of the Technical High School at Delft, and deals in an exhaustive manner with the possibility of commercially utilizing the wax-coating of the sugar cane. In addition there is an account of the chemistry and biological significance of vegetable waxes in general.

The botanical part of the investigation completely confirmed the results of De Bary's investigations; the origin and structure of the wax coating is illustrated by drawings of microscopical preparations.

Chemically the wax of the sugar-cane was examined as long ago as 1840 by Avequin (*Ann. Chim. Phys.*, [ii.], vol. 75, p. 28), and an analysis of it was made by the celebrated chemist Dumas. The material for this examination was obtained by carefully scraping the outside of the cane, a process which is of course not applicable on a large scale. The author of the present treatise has therefore used another method, starting from the so-called "filter dirt," a waste product of the Java sugar industry. When the cane is crushed, and subsequently extracted with hot water, nearly all the epidermal wax passes into the crude juice, where it remains suspended, until the juice is purified by the addition of lime and subsequent boiling, when the wax is carried down in the precipitate formed. Thus on filtration the wax is found in the so-called "filter dirt" which remains in the filter press, and which may contain 10 per cent. or more of wax.

By extracting fresh filter dirt with ligroine (light petroleum) a complicated mixture is obtained, consisting mostly of fats (glycerides of oleic and linolic acids), and about 30 per cent. of wax. If the filter dirt has fermented for some time, the fats have disappeared and the ligroine extract consists mostly of the wax, which is more resistant to bacterial action. The wax may be separated from fats

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* "The Wax of the Sugar-cane, and the Possibility of its Technical Production.' By A. Wijnberg, Amsterdam, 1909, pp. 193, with 2 figures and five plates.

by crystallisation from ligroine, in which it is less soluble; it then consists chiefly of myricyl alcohol and a substance of the formula, $C_{33}H_{68}O$.

The crude cane wax, thus obtained, melts above 80° and is still dark coloured. It may be bleached by means of chlorine, when it is, however, attacked to some extent. The colouring matter may also be removed by adding fuller's earth or a similar substance to the melted or dissolved wax, and allowing to settle. The product, refined by this mechanical process, closely resembles the valuable Carnauba wax, obtained from the Brazilian Palm *Copernicia cerifera*. It would appear that the latter wax can be replaced in most cases by cane wax, so that there ought to be a market for the latter article. The author advises sugar works to keep their filter dirt and let it ferment, with a view to ultimate extraction. The extraction of the crude material is being started in Java, where, it is calculated, more than 4000 tons of wax should annually be obtainable. At present, it is impossible to estimate the commercial value of cane wax with any degree of accuracy. Since it is much harder than beeswax, and closely resembles Carnauba wax, it is thought that it might be almost as valuable as the latter article, which is worth at least 11*d*. per lb. The author estimates the cost of producing refined cane wax on the large scale at 2*d*.–3*d*. per lb.

In the development of a chemical industry the utilisation of waste products is often of great importance; whether the wax of the sugar cane can be utilised technically remains to be seen, but in any case Mr. Wijnberg's book is a most important contribution towards the solution of the problem.

Flowers out of Season.—Although mild, the past autumn was not exceptionally so; several recent autumns have at any rate surpassed it in this respect. Yet an unprecedented number of shrubs which flower normally in spring were more or less in blossom in October. These unseasonable flowers open poorly, or often get scarcely beyond the bud state. Some, like the varieties of common lilac, have pushed many young inflorescences just beyond the protecting winter scales, and they are thus left exposed to the inclemencies of the winter.

On October 21st, 1910, the following shrubs were noted with fully open flowers; some, like the Laburnum, with entire inflorescences; they were all from three to seven months before their proper season:—Berberis Gagnepainii, Ceanothus thyrsiflorus, Deutzia setchuenensis, Erica hybrida and E. lusitanica, Escallonia Philippiana, Forsythia suspensa, Fothergilla major, Genista virgata, Glastonbury Thorn, Hamamelis arborea and H. Zuccariniana, Laburnum alpinum, Spiraea bracteata, S. Thunbergi and S. Van Houttei, Syringa villosa, Viburnum Tinus, V. rhytidophyllum, V. utile. As might be expected, a good number of late summer or autumn-flowering shrubs still remained in bloom.

W. J. B.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] [1910.

LII.—NEW LAURACEAE FROM THE MALAYAN REGION. IV.

J. S. Gamble.

Litsea hirsutissima, *Gamble* [Lauraceae-Litseeae] ; species conspicue molliter aureo-fulvo-villosa, *L. amarae*, Blume, var. *fusco-tomentosae*, affinis, praesertim varietati nostrae *geniculata*, quae foliis orbiculatis bullosis et ramulis geniculatis differt.

Frutex ad 2·5 m. altus ; ramuli crassiores nigrescentes, juniores cum innovationibus, marginibus nervisque foliorum, et inflorescentia pilis longis aureo-fulvis dense tecti. *Folia* membranacea, alterna, elliptica vel elliptico-ovata, acuminata et ad apicem ipsum acumine filiformi munita, basi plus minusve rotundata, supra lucida, infra pallidiora ; 15–20 cm. longa, 7–12 cm. lata ; costa gracilis, supra sulcata ; nervi utrinque 12–15, supra impressi, regulariter ad marginem curvati ; nervuli transversi conspicui paralleli ; recticulatio obscura ; petiolus crassus, 1–2 cm. longus, ad folii basin saepe geniculatus. *Flores* in umbellulis graciliter pedunculatis in axillis foliorum per 3–4 fasciculatis ; pedunculi 1 cm. longi ; bracteae involucrales 4, concavae, marginibus fimbriatae, intus glabrae ; flores in umbellulis 5–6 ; perianthii lobi oblongi, 2–3 mm. longi, glandulosi, apice dentati ; pedicelli brevissimi. *Stamina* florum ♂ 9, filamentis gracilibus ad basin longe villosis superne glabris, ordinum I et II antheris obovatis, ordinis III antheris ovatis, glandulis 2 magnis sessilibus paullo supra basin filamentorum ; florum ♀ staminodia ignota, *Drupa* ignota.

Malay Peninsula. Perak : road to Gunong Hijan, 750 m., *Curtis*, 1344 ; Goping and Thaiping, *King's Collector*, 404, 8379.

Var. **geniculata,** *Gamble*. *Ramuli* ad nodos prominenter geniculati. *Folia* breviora, 8–12 cm. longa, 6–7 cm. lata, ovata vel orbiculata, apice obtusa vel paullo apiculata, basi subcordata, bullata, supra lucida, glabra. *Flores* iis var. *typicae* similes sed antheris aliquando thecis 2 nec thecis 4 vel thecis 2 superioribus minimis, filamentis sparse hirsutis.

Malay Peninsula. Perak : Goping, *King's Collector*, 878.

(18086—6a.) Wt. 92—428. 1375 12/10. D & S.

Litsea spathacea, *Gamble* (Lauraceae-Litseeae); species distincta, perianthio fructifero chartaceo fisso, foliis magnis submembranaceis et drupis pericarpio tenui insignis.

Frutex vel *arbor* parva, vix ad 6 m. alta, 5–8 cm. trunci diametro; ramuli crassiores, pallidi, striati, lenticellati, ultimi puberuli. *Folia* submembranacea, alterna, elliptico-oblonga vel -oblanceolata vel -obovata, apice obtusa vel acuta, aliquando cuspidata, basi curvata vel attenuata, glabra, infra glaucescentia raro rufescentia; 8–24 cm. longa, 5–10 cm. lata; costa pallida, gracilis, supra impressa; nervi utrinque 9–12, pallidi, curvati et prope marginem arcuati; nervuli transversi pauci, fere recti, lucidi, infra reticulatio neque conspicui; petiolus 0·5–2 cm. longus, paullo alatus. *Flores* in umbellulis sessilibus vel brevissime pedunculatis in racemis brevibus paucifloris longebracteatis axillaribus vel lateralibus; bracteae subulatae, 3–5 mm. longae; bracteae involucrales 6, ovato-orbiculares, 5–7 mm. longae, 3 interiores breviores, omnes extra dense tomentosae, intus glabrae; flores in umbellulis 6; perianthii tubus in ♂ 1·5 mm. in ♀ 3 mm. longus; lobi ovati, acuti, ciliati, 3 mm. longi. *Stamina* florum ♂ 9–12, ordinum I et II 4 mm. longa, antheris ovatis filamentis gracilibus, ordinum II et IV glandulis 2 ad basin, 2·5 mm. longa. *Staminodia* florum ♂ etiam 9–12, ordinum I et II clavata, 3 mm. longa, ordinum III et IV 1·5 mm. longa, glandulis 2 oblongis. *Ovarium* florum ♂ rudimentarium minimum, stylo brevi, stigmate peltato; florum ♀ ovoideum, stylo carnoso geniculato, stigmate peltato. *Drupa* ovoidea, apiculata, 1·2–1·5 cm. longa, in perianthii tubo elongato tenui chartaceo 1·2 cm. longo et in segmentis 2–3 fisso insidens, perianthii lobis persistentibus; pericarpium tenue glabrum; cotyledones semi-ovoidei, carnosi.

Malay Peninsula. Perak: at Relan Tujor, Sungie Larut and Maxwell's hill, *Wray*, 2198, 2286, 2755; at Maxwell's hill, *Scortechini*, 1410; among rocks in forest up to 1000 m. alt., *King's Collector*, 3493, 4971, 5130, 5280; *Ridley*. Selangor: at Kwala Lumpur, *Curtis*, 2371.

Var. **tomentosa,** *Gamble*. *Folia* magis obovata, ferrugineo-pubescentia.

Malay Peninsula. Perak, *Scortechini*, 1289.

Litsea singaporensis, *Gamble* [Lauraceae-Litseeae]; species *L. salicifoliae*, Roxb. et *L. laetae*, Wall., affinis, ab hac foliis oblanceolatis et drupa majore, ab illa foliorum nervis et nervulis paucioribus minus conspicuis differt.

Arbor ?; ramuli modice crassi, glabri, pallide brunnei. *Folia* coriacea, alterna, oblongo-lanceolata vel-oblanceolata, apice obtusa vel obtuse acuminata, basi longe cuneata, supra glabra, nitida, infra laevia, glabra, pallida; 15–30 cm. longa, 4–7 cm. lata; costa crassa, complanata vel paullo prominens; nervi utrinque 6–12, obscuri, supra paullo impressi; reticulatio areolata in utraque facie satis conspicua; petiolus brevis, rugosus, 1·5–2 cm. longus. *Flores* in umbellulis puberulis pedunculatis (ad 1·3 cm.), in racemis crassis axillaribus vel lateralibus 7 mm. longis; bracteae involucrales 4, tenues, orbiculares, concavae; flores in umbellulis 5 pedicellis crassis brevibus; perianthii tubus brevis, lobi spathulati, extra ferrugineo-villosi. *Stamina* florum ♂ (alabastra tantum) 12, ordinum interiorum glandulis 2; staminodia florum ♀ ignota, ut

etiam ovarium. *Drupa* depresso-globosa, 1·5 cm. diametro, supra cupulam tenuem brevem hemisphaericam 7 mm. altam 1·6 cm. latam insidens ; cupula matura latior, rugosa vel pustulata, margine integro laevi ; pedicellus incrassatus, brevis, 6–7 mm. longus ; pericarpium laeve, siccitate flavescens.

Malay Peninsula. Singapore : at Bukit Timah, Toas, in Garden jungle and Botanic Garden, *Ridley*, 2118, 3372, 3894, 4135, 4826, 5065, 5736 ; at Tanglin, *Hullett*, 5738.

Borneo : Bongaya river, *Ridley*, 9075.

Litsea perakensis, *Gamble* [Lauraceae-Litseeae] ; species insignis, facie *L. robustam*, Blume, referens, sed racemi multo breviores et drupa minor ; speciebus 3 sequentibus et praecipue *L. pustulatae*, Gamble, affinis, forma et nervatione foliorum, drupa et perianthii tubo fructifero satis differt.

Arbor ad 20 m. alta et 50 cm. trunci diametro ; ramuli nigrescentes, striati, glabri. *Folia* subcoriacea, alterna, oblonga, oblongo-obovata vel -oblanceolata, apice obtusa, acuta vel aliquando acuminata, basi attenuata, supra lucida, olivacea, infra subglauca, utrinsecus glabra, marginibus recurvis ; 15–30 cm. longa, 5–8 cm. lata ; costa crassa, rufescens, supra vix prominens ; nervi utrinque 10–12 irregulariter paralleli, marginem versus curvati, ultimi fere ad apicem ipsum ; nervuli transversi pauci, reticulatio neque obscuri ; petiolus crassus, 1·5–3 cm. longus, glaber. *Flores* in umbellulis pedunculatis in racemis axillaribus vel lateralibus glabris vel minute puberulis vix 1 cm. longis ; pedunculi graciles, 0·8–1 cm. longi ; bracteae lanceolatae, acuminatae ; umbellulae ♂ apertae, 1 cm. latae, floribus 5 ; bracteae involucrales 4, orbiculares, concavae, intus glabrae, 3–4 mm. diametro, pedicelli 2–3 mm. longi; perianthii lobi oblongi, apice ciliati, 3 mm. longi. *Stamina* florum ♂ 9–12, vulgo 12, ordinum I et II 5–6 mm. longa, antheris obovatis et filamentis gracilibus parce villosis, ordinum III et IV breviora, glandulis 2 rotundatis stipitatis prope basim filamentorum; staminodia florum ♀ nondum visa. *Ovarium* in floribus ♂ rudimentarium, stylo crasso, stigmate capitato. *Drupa* lucida, globosa, 1 cm. diametro, apiculata, supra perianthii tubum incrassatum 5 mm. altum, ore 1 cm. diametro del insidens ; pedicellus incrassatus complanatus, 0·8–1 cm. longus, cupulaque tuberculatus ; pericarpium primo albo-maculatum, siccitate flavum.

Malay Peninsula. Perak : at Larut and Goping up to 250 m., *King's Collector*, 5114, 6069, 6085. Johore : at Sungei Telrang, *Ridley*, 13,233. Singapore : at Bukit Timah, *Ridley*, 14,135.

Litsea pustulata, *Gamble* [Lauraceae-Litseeae] ; species *L. perakensi*, Gamble, affinis, foliis latioribus elliptico-oblongis, drupa majore et perianthii tubo fructifero maturitate complanato differt.

Arbor parva vel mediocris, ad 12–18 m. alta et 25–37 cm. trunci diametro ; ramuli crassi, pallidi, striati, ultimi puberuli. *Folia* subcoriacea, alterna, elliptico-oblonga, apice rotundata vel breviter acuminata, basi rotundata vel attenuata, supra lucida, glabra, infra subglauca, marginibus recurvis ; 18–35 cm. longa, 8–14 cm. lata ; costa crassa, supra complanata, nervi utrinque 8–12 paullo impressi, ad marginem curvati, ultimi fere ad apicem attingentes ; nervuli transversi numerosi, arcuati ; reticulatio obscure areolata ; petiolus

crassus, 2-3 cm. longus. *Flores* in umbellulis in racemis brevibus axillaribus vel lateralibus 1 cm. longis. *Drupa* globosa, paullo depressa, 1·5 cm. diametro, supra perianthii tubum incrassatum pustulato-rugosum primo fere clausum, serius hemisphericum, tandem patelliformem insidens ; pedicellus incrassatus, etiam rugosus et pustulatus, complanatus, 0·8–1·2 cm. longus ; pericarpium laeve, siccitate flavescens.

Malay Peninsula. Perak : in dense forest near Larut up to 250 m., *King's Collector*, 2544, 3418, 5140.

Litsea patellaris, *Gamble* [Lauraceae-Litseeae] ; species a *L. perakensi*, Gamble et *L. pustulata*, Gamble, foliis infra glaucis, reticulatione areolata et perianthii tubo fructifero vix pustulato differt.

Arbor patula, ad 12–18 m. alta, 20–30 cm. trunci diametro ; ramuli crassi, laeves, ultimi puberuli. *Folia* subcoriacea, alterna, oblonga vel obovata, apice abrupte acuminata, basi cuneata, supra laevia, lucida, glabra, infra glauca, primo minute puberula, tandem glabra, marginibus recurvis ; 20–40 cm. longa, 7–14 cm. lata ; costa crassa, supra plana ; nervi utrinque 8–10, paullo impressi, obliqui et vix ad marginem curvati ibique gradatim arcuati ; nervuli transversi numerosi, arcuati, ramosi ; reticulatio minute areolata ; petiolus crassus, 2–3 cm. longus. *Flores* ignoti, racemi fructiferi axillares, brevissimi. *Drupa* globosa, paullo depressa, 1–1·2 cm. alta, 1·5 cm. diametro, supra perianthii tubum incrassatum complanatum patelliformem 1–1·2 cm. diametro insidens ; pedicellus fructifer complanatus, cum cupula 7–8 mm. longus ; pericarpium maturum coccineum, lucidum, siccitate flavum, rugatum.

Malay Peninsula. Perak : near Larut, in dense forest at 150–250 m., *King's Collector*, 7312.

Litsea fenestrata, *Gamble* [Lauraceae-Litseeae] ; species *L. patellari*, Gamble, affinis, foliis pergamaceis apice rotundatis, nervis magis patulis atque drupa cupula maxime lignosa clausa differt.

Arbor magna ad 30 m. alta ; ramuli crassissimi cortice pallido, ultimi angulati et minute puberuli. *Folia* pergamacea, alterna, oblonga vel oblongo-obovata, apice rotundata vel retusa, basi attenuata vel rotundata, saepe inaequalia ; supra plus minusve lucida, olivacea, infra subglauca, glabra, marginibus recurvis cartilagineis ; 15–35 cm. longa, 8–14 cm. lata ; costa crassissima, supra fere complanata ; nervi utrinque 10–15, distantes, paullo impressi, ad marginem curvati ; nervuli transversi irregulares, ramosi ; reticulatio areolata ; petiolus crassus, 1–2·5 cm. longus, rugosus. *Flores* in umbellulis breviter pedunculatis in fasciculis densis secus ramulos vetustiores ; pedunculi crassi, 7 mm. longi, fusco-puberuli ; umbellulae apertae, 1·2 cm. diametro, 6–7, flavae, pedicellis 4 mm. longis ; bracteae involucrales 4–5, orbiculares vel obovatae, concavae, extus fulvo-puberulae ; perianthii lobi 6, oblongi, obtusi, extus villosi, intus glabri, 4–5 mm. longi. *Stamina* florum ♂ numero variabilia, normaliter 12, ordinum I et II 6–7 mm. longa, antheris ellipticis decurrentibus et filamentis gracilibus parce villosis basi interdum glandulas ferentibus ; ordinum III et IV breviora, glandulis 2 oblongis bifidis stipitatis prope basin filamentorum ; staminodia florum ♀ ignota. *Ovarium* in floribus ♂ rudimentarium 0. *Drupa*

globosa, 2·2 cm. diametro, primo perianthii tubo incrassato pyriformi furfuraceo omnino circumdata ; serius cupula 2 cm. longa, ore aperto rotundo 1–1·2 cm. diametro inclusa ; tandem ore fere 2·5 cm. lato, semi-exserta ; pedicellus incrassatus, crassus, 5 mm. longus ; pericarpium crassum, primo cereo-album, tandem purpureum.

Malay Peninsula. Perak : near Larut to 250 m., *King's Collector*, 5938, 6859.

Sumatra. At 450 m., *Forbes*, 3174.

Borneo. Near Kuching, *Haviland*, 3088?.

Litsea Foxiana, *Gamble* [Lauraceae-Litseeae] ; species cum sequente *L. monticola*, Gamble, foliorum nervis parallelis plurimis insignis, ab illa foliis apice cuspidatis et racemis griseo-pubescentibus differt.

Arbor mediocris ; ramuli crassi, pallidi, ultimi angulati, minute ferrugineo-pubescentes ut etiam foliorum petioli et costa et inflorescentia. *Folia* subcoriacea, alterna, elliptica vel elliptico-oblonga vel -obovata, apice longe cuspidato-acuminata, basi attenuata, supra fusca, opaca, costa et nervis exceptis glabra, infra glaucescentia et minute puberula, marginibus recurvis ; 10–20 cm. longa, 5–7 cm. lata ; costa crassa, conspicua, pubescens ; nervi utrinque 12–16 paralleli, vix curvati nisi ad marginem, ultimi 2 vel 3 arcuatim juncti ; nervuli transversi plurimi, recti, paralleli ; reticulatio obscura ; petiolus crassus, 2–3 cm. longus. *Flores* in umbellulis graciliter pedunculatis (6 mm.), in racemis griseo-pubescentibus, axillaribus vel lateralibus ad 2 cm. (♂) vel 5 mm. (♀) longis ; racemi aliquando fasciculati per 2–3 ; umbellulae apertae, diametro 1 cm. (♂) vel 8 mm. (♀) floribus 5–6 ; bracteae involucrales 4, orbiculares, concavae, 4–5 mm. diametro ; perianthii lobi oblongi, obtusi vel acuti, villosi, ciliati, 3 mm. (♂) vel 1·5–2 mm. (♀) longi. *Stamina* florum ♂ 8–10, normaliter 9, ordinum I et II 3–4 mm. longa, antheris ovatis et filamentis graciliter villosis ; ordinum III et IV breviora, glandulis 2 parvulis subsessilibus prope basin filamentorum. *Staminodia* florum ♀ normaliter 9, ordinum I et II clavata, 2–3 mm. longa, filamentis villosis ; ordinum III et IV subulata, glandulis 2 ovatis prope basin. *Ovarium* in floribus ♂ 0, in ♀ globosum, glabrum ; stylo crasso curvato, stigmate magno bifido. *Drupa* ignota.

Malay Peninsula. Perak: at Moniot's road, *Curtis*, ♂ 2305, and ♀ without number.

Litsea monticola, *Gamble* [Lauraceae-Litseeae] ; species nervis parallelis insignis, *L. Foxianae*, Gamble, affinis, foliis acutis nec cuspidatis infra haud glaucescentibus, umbellulis glabris, floribus dense villosi differt.

Arbor ad 12–15 m. alta et 45–60 cm. trunci diametro ; ramuli crassi, pallidi, subquadrangulares, furfuracei, glabri. *Folia* coriacea, alterna, elliptica vel elliptico-oblonga vel -obovata, apice acuta vel acuminata et paullo mucronata, basi attenuata, utrinsecus glabra, olivacea, infra rufescentia, marginibus recurvis ; 10–20 cm. longa, 4–6 cm. lata ; costa conspicua, supra impressa ; nervi utrinque 8–12, subparalleli, impressi, ad marginem curvati ; nervuli transversi recti, subparalleli, obscuri ; reticulatio obscure areolata ; petiolus crassus, nigrescens, glaber, sulcatus, 1·5 cm. longus. *Flores*

in umbellulis pedunculatis in racemis axillaribus vel lateralibus 8–10 floris, ad 2 cm. longis; pedunculi glabri, 6–8 mm. longi; bracteae involucrales 4, orbiculares, 4–5 mm. diametro; flores in umbellulis 5, aureo-fulvo-villosi; perianthii lobi 6, ovati, acuti vel acuminati, extra dense villosi, intus glabri, glandulosi. *Stamina* florum ♂ numero et ordine variabilia, 8–13, normaliter 9; ordinum I et II 3 mm. longa, antheris oblongis et filamentis deuse villosis; ordinum III et IV breviora, glandulis 2 magnis ovatis subsessilibus prope basin filamentorum. *Ovarium* in ♂ 0. *Staminodia* florum ♀ et *drupa* ignota.

Malay Peninsula. Perak: top of Gunong Ejon, 1200–1400 m., and near Taiping, 1000–1200 m., *King's Collector*, 7000, 8454.

Litsea Scortechinii, *Gamble* [Lauraceae-Litseeae]; species obscura, foliis lanceolatis, acuminatis, conspicue minute areolatis insignis.

Arbor?; ramuli castaneo-fulvi, ferrugineo-puberuli, paullo angulati, innovationes aureo-pubescentes ut etiam inflorescentia. *Folia* chartacea, alterna, lanceolata vel elliptico-lanceolata, apice longe et tenuiter acuminata, basi attenuata, supra praeter nervos glabra, minute reticulata, infra pubescentia; 10–17 cm. longa, 4–6 cm. lata; costa gracilis, conspicua, supra impressa et puberula; nervi utrinque 6–10, supra impressi, paribus suboppositis, ad marginem curvati et ibi arcuatim juncti; nervuli transversi numerosi; reticulatio minute areolata; petiolus gracilis, 1–2 cm. longus. *Flores* in umbellulis pedunculatis in racemis crassissimis axillaribus vel lateralibus 3–5 mm. longis; bracteae involucrales 5, membranaceae, intus glabrae, marginibus fimbriatae; flores in umbellulis 5; perianthii lobi oblongi, dense aureo-villosi. *Stamina* florum ♂ normaliter 9, ad basin conspicue longe villosi; ordinum I et II antheris subquadratis; ordinum III et IV glandulis 2 oblongis sessilibus ad dimidiam partem filamentorum. *Staminodia* florum ♀ et *drupa* ignota.

Malay Peninsula. Perak: at Haram Parah, *Scortechini*, 866.

Litsea oblanceolata, *Gamble* [Lauraceae-Litseeae]; species *L. ochraceae*, Boerl., affinis, foliis oblanceolatis, racemis multo brevioribus et umbellulis sessilibus differt.

Arbor parva, ad 10–12 m. alta et 45 cm. trunci diametro; ramuli pallide fusci, graciles, lenticellati; innovationes et inflorescentia ferrugineo-pubescentes. *Folia* chartacea, alterna, oblanceolata, apice obtusa, acumine brevi, basi longe cuneata, utrinsecus glabra, supra pallide fusca, infra subglauca; 10–23 cm. longa, 3–6 cm. lata; costa gracilis; nervuli transversi recti, sed obscuri ut etiam reticulatio; petiolus gracilis, tortus, 1–1·5 cm. longus. *Flores* in umbellulis sessilibus in racemis axillaribus et lateralibus 7 mm. longis; bracteae ovatae, tomentosae; bracteae involucrales 4, orbiculares, concavae; flores in umbellulis 4–5, pedicellis 2 mm. longis; perianthii lobi ovati, obtusi, intus glabri, 2 mm. longi. *Stamina* florum ♂ 9–12, gracilia, glabra, ordinum I et II exserta, ordinum III et IV breviora, glandulis 2 oblongis sessilibus paullo supra basin filamentorum; staminodia florum ♀ ignota. *Ovarium* in floribus ♂ rudimentarium, parvum, stylo gracili, stigmate parvo bifido. *Drupa* ignota.

Malay Peninsula. Perak: moist places near Larut up to 90 m., *King's Collector*, 1952, 2020.

Litsea Kunstleri, *Gamble* [Lauraceae-Litseeae]; species insignis, *L. sebiferae*, Blume, affinis, racemis fasciculatis brevissimis differt; *L. perakensi*, Gamble, etiam accedit, sed foliis chartaceis apice rotundatis griseis distinguenda.

Arbor ad 18 m. alta et circa 50 cm. trunci diametro; ramuli crassi, angulati, grisei vel glauci, glabri. *Folia* chartacea, alterna, oblonga vel oblongo-lanceolata, apice rotundata vel emarginata, basi attenuata et paullo rotundata, supra olivacea, infra subglauca, utrinsecus glabra; 15–30 cm. longa, 6–12 cm. lata; costa gracilis supra paullo sulcata; nervi utrinque 12–14, graciles, ad marginem curvati et in sinus arcuatos desinentes, supra impressi; petiolus crassus, glaber, supra sulcatus, 1–2 cm. longus. *Flores* in umbellulis griseo-puberulis pedunculatis, in racemis brevibus crassis fasciculatis (circa 10) axillaribus vel lateralibus ad 1 cm. longis; pedunculi graciles 8 mm. longi; bracteae ovatae, caducae; umbellulae apertae ad 1·2 cm. latae, floribus 7, pedicellis 2 mm. longis; bracteae involucrales 4–6, externae orbiculares, internae obovatae, intus glabrae; perianthii lobi 6, oblongi vel obovati, 3–4 mm. longi, glandulosi, intus glabri. *Stamina* florum ♂ 12, ordinum I et II ad 4 mm. longa, antheris ovatis et filamentis gracilibus villosis; ordinum III et IV breviora et glandulis 2 reniformibus stipitatis prope basin filamentorum munita, staminodia florum ♀ ignota. *Ovarium* in floribus ♂ rudimentarium parvum, stylo gracili. *Drupa* ignota.

Malay Peninsula. Perak: near Gunong Pondo and Gunong Bubu, up to 250 m., *King's Collector*, 7527, 7670.

Litsea claviflora, *Gamble* [Lauraceae-Litseeae]; species *L. gemelliflorae*, Boerl., affinis, foliis crassioribus, pedunculis haud filiformibus et umbellulis ex axillis foliorum plurimis differt.

Arbor ad 10–12 m. alta et 20–25 cm. trunci diametro; ramuli crassi, pallidi, innovationibus puberulis exceptis glabri. *Folia* chartacea, alterna, elliptico-lanceolata vel -oblanceolata, apice breviter acuminata, basi attenuata, supra olivacea, opaca, infra glauca; 10–18 cm. longa, 4–8 cm. lata; costa gracilis supra impressa; nervi utrinque circa 6, impressi, ad marginem curvati et ibi gradatim arcuati; nervuli transversi conspicui, distantes, reticulatione conspicua juncti; petiolus gracilis, 0·8–1 cm. longus. *Flores* in umbellulis subglabris longe pedunculatis per 2–3 fasciculatis in racemis brevissimis ex axillis foliorum ultimorum vel foliorum delapsorum; pedunculi claviformes, 1–2 cm. longi; umbellulae apertae circa 7 mm. latae, floribus 5; bracteae involucrales 4, orbiculares, concavae, 4 mm. latae; perianthii tubus brevis, intus villosus, lobi 6 oblongi, obtusi, glandulosi, glabri, 2 mm. longi. *Stamina* florum ♂ 12, ordinum I et II 3–4 mm. longa, antheris ellipticis et filamentis villosis; ordinum III et IV breviora, antheris oblongis obtusis et glandulis 2 subsessilibus quadratis prope basin filamentorum; staminodia florum ♀ ignota. *Ovarium* in floribus ♂ rudimentarium, conicum, glabrum. *Drupa* ignota.

Malay Peninsula. Perak: near Thaiping, at 150–300 m., *King's Collector*, 8492.

Litsea Curtisii, *Gamble* [Lauraceae-Litseeae]; species *L. Panamonjae*, Ham., affinis, foliis latioribus submembranaceis ellipticis, racemis glabris et ramulis angulatis differt.

Arbor magna, patula, ad 24–30 m. alta et 60–90 cm. trunci diametro ; ramuli crassi, angulati, fere alati, nigrescentes. *Folia* submembranacea, alterna, elliptica vel elliptico-obovata, apice rotundata et brevissime acuminata, aliquando emarginata, basi attenuata et subcuneata, utrinsecus glabra, infra glaucina ; 15–26 cm. longa, 6–11 cm. lata ; costa crassa, immersa ; nervi utrinque 13–15, supra paullo impressi, primo recti deinde curvati et prope marginem gradatim arcuati ; nervuli transversi distantes, obscuri, sicut reticulatio ; petiolus crassus, nigrescens, rectus, 2–2·5 cm. longus. *Flores* in umbellulis pedunculatis distantibus in racemis axillaribus vel lateralibus vel etiam subterminalibus 10-25 cm. longis (♂) vel 10 cm. longis (♀) ; pedunculi 6 mm. longi ; umbellulae apertae 1 cm. latae in ♂, in ♀ angustiores, flores in umbellulis 5–6 ; bracteae involucrales 4, glabrae vel minutissime puberulae, concavae, patulae ; perianthii tubus 2·5 mm. longus, intus villosus, lobi 6–9, membranacei, obovati, acuti, 3·5 mm. longi in ♂, in ♀ breviores. *Stamina* florum ♂ 9–14, vulgo 9, glabra, ordinum I et II 4 mm. longa, antheris ovatis apiculatis et filamentis gracilibus, ordinum III et IV glandulis 2 reniformibus, stipitatis, prope basin filamentorum ; staminodia florum ♀ 12–16, ordinum I et II spathulata, glandulosa, ordinum III et IV subulata, glandulis 2 magnis sessilibus ad dimidiam partem filamentorum. *Ovarium* in ♂ rudimentarium, minimum, in tubo perianthii inclusum, stylo minuto ; in ♀ ovoideum glabrum, stylo crasso curvato, stigmate peltato. *Drupa* non visa.

Malay Peninsula. Penang : Government Hill, 360 m., *Curtis*, 2449. Perak : near Larut, 90–150 m., *King's Collector*, 6161 ; *Scortechini*, 162.

Litsea megacarpa, *Gamble* [Lauraceae-Litseeae] ; species insignis, *L. Noronhae*, Blume, affinis, racemis brevioribus puberulis nec tomentosis, foliis coriaceis, et drupa maxima cupula patelliformi suffulta differt.

Arbor magna, patula, ad 18–30 m. alta ; ramuli crassi, ultimi angulati, nigrescentes, glabri. *Folia* coriacea, alterna, glabra, elliptico-oblonga vel -obovata, apice obtusa, apiculata, raro cuspidata, basi attenuata, supra lucida, brunnea, infra cinerea, marginibus paullo recurvis ; 15–45 cm. longa, 7–20 cm. lata ; costa crassa, supra immersa ; nervi utrinque 10–15, distantes, irregulares, marginem versus curvati ; nervuli transversi obscuri, irregulares, ramosi ; reticulatio areolata ; petiolus crassus, curvatus, 1·5–6 cm. longus, supra sulcatus. *Flores* in umbellulis graciliter pedunculatis in racemis gracilibus axillaribus vel lateralibus 10–15 cm. (♂) vel 5–10 cm. (♀) longis ; pedunculi 0·5–2 cm. longi ; rhachis angulata, puberula vel glabrescens ; bracteae minutae, caducae ; bracteae involucrales 4, orbiculares, concavae, puberulae ; flores aperti 1 cm. (♂) vel 5 mm. (♀) lati, in umbellulis 4–5 ; perianthii tubus 1·5 mm. longus, lobi 6, ovati, acuminati, 2 mm. (♂) vel 1 mm. (♀) longi. *Stamina* florum ♂ 9–12, vulgo 12, glabra, ordinum I et II 4 mm. longa, antheris oblongis et filamentis gracilibus, ordinum III et IV breviora, glandulis 2 sessilibus vel stipitatis prope basin filamentorum ; ovarii rudimentum 0 vel parvum, conoideum. *Staminodia* florum ♀ 12, glabra, ordinum I et II clavata, 1·5 mm. longa, ordinum III et IV subulata, 1 mm. longa, glandulis 2 magnis

lobatis ad basin. *Ovarium* ovoideum, stylo crasso curvato, stigmate peltato, 2–3-lobo. *Drupa* magna, globosa, paullo depressa, 2·5–3 cm. diametro; juvenilis perianthii tubo incrassato fere inclusa, deinde ad tertiam partem, denique supra cupulam patelliformem rugosam 2·5 cm. diametro insidens; pericarpium crassum, rubrum et maculatum, siccitate flavescens.

Malay Peninsula. Province Wellesley, *Curtis*, 2511. Perak, *Wray*, 2337, 2730; *Scortechini*, 265, 270, 589; *King's Collector*, 3697, 6076, 6124, 6155, 6237, 6409, 6567, 6613, 6689, 6774, 6866, 7204. Selangor: at Dusum Tua, *Ridley*, 7621. Singapore: at Toas, *Ridley*, 6455.

Litsea nidularis, *Gamble* [Lauraceae-Litseeae]; species insignis *L. megacarpae*, Gamble, affinis, racemis glabris brevioribus, foliis minoribus glaucinis oblanceolatis, et drupa in cupula lignosa nidum simulante inclusa differt.

Arbor magna ad 25–30 m. alta, 9–12 dm. trunci diametro; ramuli crassi, pallidi, teretes, siccitate striati. *Folia* coriacea, alterna, glabra, oblanceolata vel elliptico-obovata, apice rotundata et interdum emarginata, basi curvata, attenuata vel rotundata, supra lucida, infra caerulescentia, siccitate glaucina, marginibus magnopere recurvis; 10–25 cm. longa, 4–10 cm. lata; costa modice crassa, supra sulcata; nervi utrinque 10–12, supra impressi, curvati et sub marginem arcuatim juncti; nervuli transversi distantes, saepe ramosi; reticulatio conspicue areolata; petiolus crassus, 15–25 mm. longus. *Flores* in umbellulis pedunculatis distantibus in racemis glabris axillaribus vel lateralibus, 10 cm. (♂) vel 4 cm. (♀) longis; umbellulae apertae, 8–10 mm. (♂) vel 5 mm. (♀) latae, 4–5-florae; bracteae involucrales 4, glabrae, orbiculares, concavae, reflexae; perianthii lobi 6–8 (♂) vel 4–6 (♀) oblongi, acuti vel obtusi, sparse villosi, 3 mm. longi. *Stamina* florum ♂ 12–16, vulgo 12, ordinum I et II 5 mm. longa, antheris subquadratis et filamentis gracilibus sparse villosis, ordinum III et IV. breviora, antheris obovatis et glandulis 2 stipitatis ad basin filamentorum; ovarii rudimentum ovoideum, glabrum. *Staminodia* florum ♀ 9–12, ordinum I et II clavata 1 mm. longa; ordinum III et IV breviora et glandulis 2 orbiculatis stipitatis munitae. *Ovarium* ovoideum, stylo crasso, stigmate peltato. *Drupa* cerea, flava, depresso-globosa, apiculata, 1·4 cm. diametro, 7–8 mm. alta, in perianthii tubo incrassato nidiformi (cupula) fere inclusa; cupula lignosa, marginibus incurvis, ore rotundo 1–1·2 cm. diametro; pedicellus incrassatus, clavatus, complanatus, 1 cm. longus; pericarpium lucidum, laeve.

Malay Peninsula. Penang: Government Hill, 650 m., *Curtis*, 3279. Perak: at 250–300 m. alt., *King's Collector*, 6883; at Hulu Kenat, *Scortechini*, 759.

Litsea sarawacensis, *Gamble* [Lauraceae-Litseeae]; species *L. lancifoliae*, Hook. f., affinis, foliis cuspidato-acuminatis paucinerviis, drupae cupula obconica lobis deciduis nec persistentibus differt.

Arbor parva; ramuli graciles, glabri, ultimi tantum puberuli. *Folia* chartacea, opposita et subopposita; elliptico- vel oblongo-lanceolata, apice cuspidato-acuminata, basi acuta; supra siccitate rubro-fusca, vix lucida, glabra, infra pallida, glabra; 8–14 cm.

longa, 2–4 cm. lata ; costa gracilis, nervi utrinque 5–7 obliqui, marginem versus curvati et inde prominenter arcuatim juncti ; nervuli transversi horizontales ut reticulatio obscuri ; petiolus 5–6 mm. longus. *Flores* in umbellulis gracillime pedunculatis in racemis brevibus axillaribus vel lateralibus circa 5-floris, vix 4 mm. longis ; bracteae involucrales 4, orbiculares, glabrae, concavae, 2 mm. longae ; flores in umbellulis 5, subsessiles ; perianthii tubus brevis, intus dense villosus ; lobi 6, ovati, subacuti, ciliati, 1·5 mm. longi. *Stamina* florum ♂ 9, ordinum I et II filamentis gracilibus parce villosis, ordinis III breviora, glandulis 2 sessilibus prope basin, longe villosa ; ovarii rudimentum minimum vel 0. *Staminodia* florum ♀ non visa. *Drupa* (immatura) ovoidea, apiculata, perianthii tubo glabro incrassato insidens ; tubus margine glaber, teres, lobis deciduis ; pericarpium laeve, nigrescens.

Malay Peninsula. Singapore : in Reservoir woods, *Ridley*, 4817.

Borneo. Sarawak, *Beccari*, 905, 1475, 1708, 1796 ; *Haviland*, 3077, 3646.

Litsea ujongensis, *Gamble* [Lauraceae-Litseeae]; species haud bene cognita, *L. sessiliflorae*, Hook. f., affinis, foliis membranaceo-chartaceis infra caesiis pubescentibus et nervulis transversalibus et reticulatione obscuris distincta.

Arbor parva vel *arbuscula*, ad 6–9 m. alta ; ramuli graciles, ferrugineo-tomentosi. *Folia* membranacea vel chartacea, opposita vel subopposita, oblanceolata, abrupte apice cuspidato-acuminata, basi cuneata vel attenuata, supra lucida, praeter costam et nervos glabra, infra ad nervos ferrugineo-tomentosa et intra nervos caesio-pubescentia ; 12–22 cm. longa, 5–7 cm. lata ; costa parum prominens ; nervi utrinque 10–15 graciles, ad marginem curvati ; nervuli transversi obscuri, sicut reticulatio ; petiolus crassus, brevis, 5–8 mm. longus, ferrugineo-tomentosus. *Flores* in umbellulis subsessilibus in fasciculis brevibus 2–3-floris axillaribus ; perianthii lobi in ♀ circa 1 mm. longi, villosi, in fructu persistentes, ut etiam staminodia glabra linearia. *Staminodia* ordinum I et II 1·5 mm. longa, ordinis III 1 mm. longa, glandulis 2 magnis prope basin. *Flores* ♂ ignoti. *Drupa* ellipsoidea, 1 cm. longa, 8 mm. diametro, in perianthii tubo incrassato insidens ; tubus 4–5 mm. diametro, 3–4 mm. altus cum pedicello incrassato villoso ; pericarpium crustaceum, siccitate nigrum.

Malay Peninsula. Negri Sembilan : in Sungei Ujong, *Ridley's Collectors*, 1904, 1942, 2305, 2316, 5846. Malacca : at Gunong Sedang, etc., *Ridley*, 3172, 5848.

Var. **nervosa**, *Gamble*. *Folia* subsessilia basi rotundata, dense pubescentia, praecipue ad nervos ; nervi, nervuli transversi et reticulatio magis conspicui. *Ovarium* ovoideum, stylo longo, stigmate peltato bilobo.

Malay Peninsula. Perak : Gunong Batu Pateh, lower camp, *Wray*, 1129 ; *Scortechini*, 2097.

Tetradenia mollissima, *Gamble* [Lauraceae - Litseeae] ; species distincta, ut in genere *Actinodaphne* foliis subverticillatis, sed staminodiis 6 tantum, foliis lanceolatis molliter villosis insignis.

Arbor parva ; ramuli modice crassi, grisei, ultimi molliter ferrugineo - villosi ; alabastra perulis villosis suffulta. *Folia*

coriacea, opposita subopposita vel ternatim subverticillata, lanceolata, apice longe acuminata, basi acuta, supra lucida, costa excepta glabra, infra dense et molliter ferrugineo-villosa praecipue ad nervos ; 9–12 cm. longa, 2·5–3·5 cm. lata ; costa media crassa, supra prominens ; costae laterales ad dimidiam partem folii attingentes ; nervi utrinque 3-4, obliqui, supra paullo impressi ; nervuli transversi numerosi, arcuati, obscuri ; reticulatio minute areolata, sub lente tantum visa ; petiolus crassus, ferrugineo-villosus, 6–8 mm. longus. *Flores* (♀ tantum cogniti) in umbellulis sessilibus densissime ferrugineo-villosis per 1–3 confertis in axillis foliorum vel e ramulis intra nodos superiores ; bracteae involucrales caducissimae ; flores in umbellulis circa 5, pedicellis brevissimis ; perianthii tubus intus sericeo-villosus sicut etiam lobi 4 lanceolati. *Staminodia* 6, ordinum I et II lineari-clavata, 1·5–2 mm. longa, sparse villosa ; ordinis III breviora, glandulis 2 cordatis stipitatis ad basin munita. *Ovarium* ovoideum, glabrum, stylo dense villoso recto, stigmate capitato. *Stamina* et *fructus* ignota.

Malay Peninsula. Perak : at lower camp, Gunong Batu Pateh, 1000 m., *Wray*, 931.

Tetradenia kedahensis, *Gamble* [Lauraceae-Litseeae] ; species etiam facie *Actinodaphnem* referens, a *T. mollissima*, Gamble, differt foliis maturitate glabris et reticulatione prominenter areolata.

Arbor ; ramuli graciles, teretes, ultimi verticillati, dense ferrugineo-villosi. *Folia* coriacea, verticillata, elliptico-lanceolata, apice cuspidato-acuminata, basi attenuata, supra glabra, juniora tantum strigose-villosa, matura glabra, ad margines cartilaginea, recurva ; 6–11 cm. longa, 2–3·5 cm. lata ; costa media gracilis, utrinque prominens, laterales graciles, paullo supra mediam partem foliorum desinentes et inde cum nervis arcuatim junctae ; nervi laterales utrinque 3–5, graciles, oblique ad marginem curvati, et deinde arcuatim juncti ; nervuli tranversi numerosi, obscuri, arcuati ; reticulatio conspicue areolata ; petiolus gracilis, 5–6 mm. longus, pubescens. *Flores* (♂ tantum cogniti) in umbellulis sessilibus dense fasciculatis ex axillis foliorum vel e ramulis intra nodos ; bracteae breves, obtusae ; bracteae involucrales 4 orbiculares, concavae, marginibus ciliatae, extus dense ferrugineo-tomentosae, intus glabrae ; flores in umbellulis 5 ; pedunculi breviter villosi ; perianthii lobi 4, ovati, obtusi vel acuminati, dense villosi, 1·5–2 mm. longi. *Stamina* 6, ordinum I et II antheris oblongis et filamentis gracilibus glabris, ordinis III breviora, glandulis 2 stipitatis reniformibus ad basin filamentorum ; ovarium rudimentarium ovoideum, sparse villosum, stylo gracili, stigmate capitato. *Staminodia* florum ♀ et *fructus* ignota.

Malay Peninsula. Kedah : on Kedah peak, 900 m., *Ridley*, 3590, 5940.

Lindera Wrayi, *Gamble* [Lauraceae-Laureae] ; species obscura, plus minusve *L. oxyphyllae*, Hook. f., affinis, foliis obovatis longe acuminatis et umbellularum fasciculis pauciflоris differt.

Arbor parva ; ramuli modice crassi, nigrescentes ; innovationes ferrugineo-puberuli. *Folia* chartacea vel submembranacea, alterna, obovata vel elliptico-obovata vel -oblanceolata, apice cuspidato-acuminata vel interdum rotundata, basi longe cuneata, supra

glabra, nigrescentia, infra rufescentia ; 10–18 cm. longa, 3–6 cm. lata ; costa gracilis ; nervi utrinque 8–14, supra impressi, curvati et prope marginem arcuatim juncti ; nervuli transversi infra conspicui; reticulatio obscura ; petiolus gracilis, 0·8–1·8 cm. longus. *Flores* in umbellulis gracilibus pedunculatis in racemis brevibus axillaribus vel lateralibus, 7 mm. longis ; pedunculi 5–7 mm. longi ; bracteae involucrales 4, hemisphaericae, glabrae, deciduae ; flores in umbellulis ♂ circa 7, ♀ circa 8 ; pedicelli brevissimi ; perianthii lobi ovati, acuti, 1–2 mm. longi, glabri, in floribus ♀ quam in ♂ paullo breviores. *Stamina* florum ♂ 9, thecis 2, 2 mm. longa, ordinum I et II filamentis gracilibus et antheris obtusis, ordinis III glandulis 2 magnis angulatis paullo supra basin filamentorum ; ovarii rudimentum parvum, conoideum. *Staminodia* florum ♀ minutissima, ordinum I et II lineari-clavata, glabra, ordinis III subulata, glandulis 2 magnis angulatis ad mediam partem filamentorum. *Ovarium* ovoideum, stylo longo crasso curvato, stigmate peltato. *Drupa* (nondum matura) ovoidea, 0·7–1 cm. longa, pedicello incurvato ; pericarpium laeve.

Malay Peninsula. Perak : on Gunong Batu Pateh, Gunong Brumbu, Gunong Iras, Gunong Bubu, 1300–2000 m., *Wray*, 399, 1564, 3866, 4149 ; Bujong Malacca, *Ridley*, 9706 ; *Scortechini*.

LIII.—NEW ORCHIDS : DECADE 37.

361. **Eulophia aliwalensis**, *Rolfe* ; affinis *E. transvaalensi*, Rolfe, sepalis longioribus, labello late elliptico differt.

Folia 3–4, fasciculata (immatura), basi vaginis 3–4 latis obtecta. *Scapus* circiter 45 cm. longus, basi vaginis lanceolatis acutis obtectus ; racemus circiter 10 cm. longus, 7–8-florus. *Bracteae* elliptico-ovatae, acutae, 6–8 mm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* mediocres, flavi, externi brunnei. *Sepala* subconnivентia, elliptico-oblonga, subacuta, 1·2 cm. longa. *Petala* elliptica, subobtusa, sepalis multo latiora. *Labellum* late ellipticum, 3-lobum, sepalis paullo brevius ; lobi laterales late rotundati ; lobus intermedius suborbicularis ; discus carinis 7–9 valide papillosis instructus, mediis 3 ad basin extensis et vix verrucosis ; calcar gracile, subclavatum, fere strictum, 4 mm. longum. *Columna* late oblonga, 6 mm. longa, apoda.

S. Africa. Elands Hoek : near Aliwal North, on dry flat grassy ground, 1380 m., *Bolus*, 10671.

362. **Eulophia Saundersiae**, *Rolfe* ; affinis *E. lissochiloidi*, Lindl., labelli lobo intermedio duplo latiore differt.

Folia non vidi. *Scapus* erectus, vaginis oblongis obtectus ; racemus brevis, circiter 6-florus. *Bracteae* ovatae, breviter acuminatae, 0·8–1·2 cm. longae. *Pedicelli* 2–2·5 cm. longi. *Flores* flavi, brunneo-punctati. *Sepala* patentia, elliptico-oblonga, obtusa vel subapiculata, circiter 2 cm. longa. *Petala* late elliptica, obtusa, sepalis multo breviora et latiora. *Labellum* late ellipticum, petalis

aequale, 3-lobum ; lobi laterales quadrati, obtusi vel truncati, breves ; lobus intermedius late elliptico-oblongus, apice obtusus vel rotundatus, crebre venosus ; discus carinis 7 approximatis verrucosis vel papillosis instructus ; calcar late oblongum, obtusum, strictum vel leviter curvatum, 4 mm. longum. *Columna* late oblonga, 6–8 mm. longa.

S. Africa. Natal, *Mrs. K. Saunders*, 1.

363. **Eulophia Thunbergii**, *Rolfe* ; affinis *E. barbatae*, Spreng., racemis laxioribus et floribus majoribus differt.

Rhizoma validum ; nodi incrassati. *Folia* 3–4, fasciculata, linearia, subacuta, leviter recurva, 8–20 cm. longa, basi vaginis 2–3 brevibus imbricatis obtecta. *Scapi* 20–30 cm. longi, basi vaginis 2–3 lanceolatis obtecti ; racemi 8–13 cm. longi, laxiusculi. *Bracteae* lanceolatae, acuminatae, 1·2–2 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* mediocres. *Sepala* lanceolato-attenuata, apice acuminata, 2 cm. longa. *Petala* anguste ovata, subobtusa, sepalis fere duplo latiora. *Labellum* late ovatum, 3-lobum, petalis paullo brevius ; lobi laterales apice rotundati ; lobus intermedius late rotundatus ; discus carinis 5–7 cristatis et verrucosis instructus ; calcar gracile, leviter curvatum, 4 mm. longum. *Columna* clavata, 6 mm. longa.

S. Africa. *Thunberg.*

364. **Eulophia robusta**, *Rolfe* ; affinis *E. Dregeanae*, Lindl., labelli cristis gracilibus et disjectis differt.

Rhizoma validum ; nodi incrassati. *Folia* 4–6, fasciculata, ensiformia vel elongato-linearia, acuta, suberecta vel leviter recurva, 15–30 cm. longa, basi vaginis 2–3 brevibus obtecta. *Scapi* erecti, 25–45 cm. longi, vaginis numerosis lanceolatis leviter imbricatis obtecti ; racemi 8–15 cm. longi, multiflori. *Bracteae* lanceolatae, acuminatae, 1·5–2·5 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* majusculi, flavi, vel petala et labellum carnea vel alba, sepala brunnea. *Sepala* oblongo-lanceolata, acuta vel acuminata, 2 cm. longa. *Petala* elliptico-oblonga, obtusa vel subacuta, sepalis aequalia vel longiora et duplo breviora. *Labellum* late ovatum, 3-lobum, petalis paullo brevius ; lobi laterales late rotundati ; lobus intermedius late ellipticus vel rotundatus ; discus carinis 5–7 cristatis vel papillosis instructus, carinis basi verrucosis ; calcar oblongum, crassiusculum, 4 mm. longum. *Columna* late oblonga, 6 mm. longa.

S. Africa. Transvaal : near Heidelberg, 1830 m., *McLea in Herb. Bolus*, 5818, and other localities.

365. **Eulophia Nelsoni**, *Rolfe* ; affinis *E. Dregeanae*, Lindl., floribus, multo minoribus differt.

Folia 4–5, fasciculata, anguste lincaria, acuta, 8–20 cm. longa. *Scapus* circiter 45 cm. longus, basi vaginis lanceolatis obtectus ; racemi 15 cm. longi, laxi, circiter 8-flori. *Bracteae* lanceolatae, acuminatae, 1·2–2 cm. longae. *Pedicelli* 1·2–2 cm. longi. *Flores* mediocres. *Sepala* lanceolata, acuminata, circiter 1·2 cm. longa. *Petala* anguste ovato-oblonga, apiculata, sepalis fere duplo latiora. *Labellum* profunde 3-lobum ; lobi laterales oblongi, apice obtusi vel rotundati ; lobus intermedius suborbicularis, apiculatus, leviter undulatus ; discus carinis prominenter papillosis instructus, carinis

basi verrucosis ; calcar oblongum, obtusum, crassiusculum, 3 mm. longum. *Columna* clavata, circiter 6 mm. longa, basi in pedem brevem extensa.

S. Africa. Transvaal ; Pretoria district, Wanderwald, *Nelson*, 297.

366. **Eulophia oblonga**, *Rolfe* ; a *E. Dregeana*, Lindl., labelli lobo intermedio oblongo, lobis lateralibus parvis facile distinguenda.

Folia non vidi. *Scapus* crassiusculus, vaginis lanceolatis imbricatis obtectus ; racemus circiter 10 cm. longus, densus, multiflorus. *Bracteae* lanceolatae, anguste acuminatae, 1·2–2 cm. longae. *Pedicelli* 2 cm. longi. *Flores* mediocres, albi. *Sepala* oblongo-lanceolata, acuminata, leviter undulata, 2 cm. longa. *Petala* oblonga vel elliptico-oblonga, subobtusa, undulata, sepalis paullo breviora. *Labellum* oblongum, obtusum, 3-lobum, 2 cm. longum ; lobi laterales oblongi, obtusi, divergentes, 4 mm. longi ; lobus intermedius oblongus, obtusus, 8 mm. longus ; discus copiose barbatus, carinis basi verrucosis ; calcar gracile, obtusum, rectum, 4 mm. longum. *Columna* clavata, 6 mm. longa.

S. Africa. Albany : Nazaar Hills, collector not known.

367. **Eulophia Haygarthii**, *Rolfe* ; a *E. Dregeana*, Lindl., foliis latioribus, floribus majoribus et labello fere duplo latiore differt.

Folia 7–8, fasciculata, late ensiformia vel elongato-lanceolata, apice attenuata et acuta, recurva, 7–22 cm. longa, prominenter 5–7-nervia, basi late vaginata. *Scapi* laterales, 60–75 cm. longi, vaginis lanceolatis numerosis imbricatis obtecti ; racemus 10–15 cm. longus, densiusculus, multiflorus. *Bracteae* lanceolatae, acuminatae, crebre venosae, 1·3–2·5 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* majusculi. *Sepala* lanceolata vel oblongo-lanceolata, acuta vel acuminata, 2·5 cm. longa. *Petala* anguste ovata vel elliptico-ovata, acuta, sepalis fere breviora et duplo latiora. *Labellum* late ellipticum, petalis aequilongum, 3-lobum ; lobi laterales late oblongi, obtusi ; lobus intermedius orbicularis ; discus carinis 5–7 papillosis instructus, carinis basi verrucosis ; calcar oblongum, obtusum, 4 mm. longum. *Columna* clavata, 6 mm. longa.

S. Africa. Natal : Camperdown, 600 m., *Wood*, 469. *Haygarth in Herb. Wood*, 1960.

368. **Lycaste lata**, *Rolfe* ; species ex affinitate *L. Barringtoniae*, Lindl., a qua sepalis petalisque multo brevioribus et latioribus differt.

Pseudobulbi oblongo-ellipsoidei, paullo compressi, hexangulares, angulis obtusis, circiter 6·5 cm. longi, 3·5 cm. lati, diphylli. *Folia* petiolata, elliptico-lanceolata, breviter acuminata, plicata, prominenter trinervia, circiter 21 cm. longa, 6 cm. lata ; petiolus circiter 6 cm. longus. *Scapus* brevis, circiter 3 cm. longus, basi vaginis membranaceis obtectus. *Bracteae* ovatae, acuminatae, valde concavae, 3·5 cm. longae. *Pedicelli* 2 cm. longi. *Sepalum* posticum obovato-oblongum, subobtusum, incurvum, 4 cm. longum, fere 2 cm. latum ; sepala lateralia subfalcata, elliptico-oblonga, subobtusa, 3·5 cm. longa, 1·8 cm. lata. *Petala* subspathulata, 3 cm. longa ; limbus suborbiculari-ovatus, subobtusus, fere 2 cm. latus, basi cuneatus. *Labellum* recurvum, obscure-trilobum, elliptico-oblongum,

4 cm. longum, 1·5 cm. latum ; lobus intermedius longe fimbriatus ; callus obovato-oblongus, truncatus, 5-carinatus. *Columna* arcuata, 2 cm. longa ; alae breviter triangulares, subacutae. *Mentum* conicum, 1·5 cm. longum.

PERU. *Forget.*

Flowered with Messrs. Sander & Sons, St. Albans, in November, 1910. The sepals and apex of the petals are green, and the rest of the flower white.

369. **Oncidium (Cimiciferum) Ballii,** *Rolfe ;* habitu *O. murino,* Reichb. f., simile, sed bracteis majoribus, labello oblongo obtuso et callo lato differt.

Pseudobulbi conferti, ovati, compressi, ancipites, 5–6 cm. longi, circiter 3 cm. lati, apice monophylli, basi diphylli. *Folia* oblonga, subobtusa, basi conduplicata, 10–16 cm. longa, 2·5–4 cm. lata. *Scapi* axillares, suberecti, circiter 30 cm. longi, basi vaginis spathaceis adpressis obtecti, supra ramosi ; paniculae strictae, angustae, densae, circiter 17 cm. longae, multiflorae ; ramuli 1–2 cm. longi, basi vaginis lanceolatis obtecti. *Bracteae* ovatae, subobtusae, concavae, 4–5 mm. longae. *Pedicelli* 4–6 mm. longi. *Flores* parvi, numerosi. *Sepala* et *petala* patentia, oblonga vel obovato-oblonga, apiculata, prope apicem subundulata, 6–7 mm. longa, sepala basi angusta. *Labellum* patens, carnosum, subintegrum, deltoideo-oblongum, obtusum, circiter 5 mm. longum, basi valde carnosum, nitidum, breviter et obtuse bicarinatum. *Columna* lata, 3 mm. longa, exalata.

Flowered in the collection of Mr. G. Shorland Ball, Burton, Westmorland, in October, 1908, and at Kew in September, 1910, the latter plant having been presented by Mr. Ball in August, 1909. The flowers are bright yellow, with brown markings on the lower half of the sepals and petals, and the base of the lip darker shining brown.

370. **Sigmatostalix peruviana,** *Rolfe ;* a *S. aurosanguinea,* Reichb. f., sepalis petalisque subaequalibus, labello non mutico differt.

Planta caespitosa, 5–7 cm. alta. *Pseudobulbi* ovoidei vel ovoideo-oblongi, subcompressi, circiter 1·5 cm. longi, basi tetraphylli, apice monophylli. *Folia* linearia, subobtusa vel minute denticulata, basi conduplicata, 3–4·5 cm. longa, 2–3 mm. lata. *Scapi* laterales, graciles, circiter 5 cm. longi, vaginis paucis obtecti, pauciflori. *Bracteae* ovato-oblongae, subobtusae, 3 mm. longae. *Pedicelli* graciles, circiter 4 mm. longi. *Sepala* patentia, oblonga, subobtusa, apice recurva, 3 mm. longa. *Petala* suberecta, oblonga, subobtusa, apice recurva, 3 mm. longa. *Labellum* subsessile, patens, deltoideo-reniforme, obtusum, undulatum, basi angulatum, 4 mm. longum, 5 mm. latum, basi callo 5-lobo nitido instructum. *Columna* clavata, 2 mm. longa ; alae minutae, uncinatae.

PERU. *Forget.*

Flowered with Messrs. Sander & Sons, St. Albans, in November, 1910. The sepals and petals are straw-coloured, the dorsal sepal and petals having a dark purple band at the base, and the lip light-yellow, with a shining orange-yellow crest.

LIV.—A NATIONAL BOTANIC GARDEN FOR SOUTH AFRICA.

Professor H. H. W. Pearson, Professor of Botany in the South African College, Cape Town, has advocated the need for the establishment of a South African National Botanic Garden in his address as President of Section C. of the South African Association for the Advancement of Science.

The meeting of the Association synchronising as it does with the consummation of the Union of South Africa renders the consideration of this question particularly opportune, and there is hardly room for doubt that the able and well-reasoned statements advanced in support of this proposal will receive the careful attention of the Government of South Africa.

Space does not permit the reproduction of the address in its entirety but in view of the interest and importance of the subject to scientific workers outside South Africa as well as to those within the borders of the Union, some of its more salient passages are here reprinted.

Professor Pearson after a few introductory remarks proceeds to consider the general question of a National Botanic Garden.

"It is," he points out, "a subject of such far-reaching importance to a Pastoral and an Agricultural South Africa that I enter upon it with some trepidation lest any ill-considered words of mine should tend rather to hinder than to forward an object with which I am convinced that this Section as a whole will be in full sympathy. The country is so vast, its people so scattered and the interests of different sections of the population in many respects so divergent, that one whose outlook has of necessity been somewhat circumscribed and whose knowledge of the great spaces now united under one Government is somewhat limited, can hardly hope to avoid some of the pitfalls with which this question is beset. But these disabilities may confer at least one advantage: they perhaps prevent me from being overcome at the outset by the magnitude of the difficulties which lie in the way of the achievement of the purpose I am advocating. That this is a real advantage I do not doubt; for the difficulties, great as they may be, will none of them prove insurmountable when we reach them.

"The chief danger of which I am conscious at the outset is that in the attempt to take a broad view of this question, less than justice should be done to the excellent institutions, variously known as 'Public,' 'Municipal' or 'Botanic' Gardens, which are scattered up and down the country. They are all alike in that they have done and are doing very useful work which deserves all the support that they receive. In the Cape Province alone there are twenty such gardens receiving in 1909, Government grants varying from £9 15*s.* to £500, and amounting in all to £1,691. Whatever titles they bear, however, these are not Botanic Gardens in any true sense; the more restricted functions of Municipal Gardens they perform with great credit to their supporters and curators, and no one, in advocating the foundation of a truly National Botanic Garden would wish to see their usefulness impaired. On the contrary, they could not but be strengthened by the establishment of such a National institution.

"The Natal Botanic Garden stands apart from the rest. It has played no small part in the economic development of the province which it serves and from it has emanated taxonomic work of a high scientific value. On its establishment, more than half a century ago, it received an annual grant of £50 from the Government. This was gradually raised to £359. In addition, the Government contributed, in 1909–10, £250 towards the upkeep of the Herbarium and in aid of the publications proceeding from it. The total income of the establishment in 1909–10 was £2,353 14*s.* 6*d.*, of which £1,236 19*s.* 7*d.* was derived from the sale of plants. It follows, therefore, that the proper work of a Botanic Garden has been very largely subordinated to the necessity of maintaining what MacOwan called 'the perpetual fight against insolvency.' But, hampered as its activities have been in this respect as well as by its unsuitable locality, unfruitful soil and restricted space (50 acres), it has consistently striven to fulfil the functions of a Botanic Garden. The measure of success which it has achieved is due to the skill and enthusiasm with which it has been guided for more than 28 years by Mr. Medley Wood, its able and respected Director.

"The oldest of the South African Gardens—the Municipal Garden of Cape Town—was established under the name of a Botanic Garden in 1848. The objects of the founders, as stated on the subscribers' tickets were :—

"1. To introduce from all parts of the globe useful, ornamental and fruit-bearing trees, shrubs, plants, flowers and vegetables, and to promote their distribution and culture throughout Southern Africa.

"2. To afford an acclimating resting-place and depôt for exotics in the course of interchange between the eastern and western hemispheres.

"3. To afford facilities for the study of Botany as a science and in connection with the horticulture and agriculture of the Cape and for training practical gardeners.

"4. To provide, for the recreation and amusement of the public and strangers, a garden with shady walks, arbours, seats, fountains, green-houses and a display of the choicest and most delicate flowers.

"These include some of the important functions of a Botanic Garden as this term is now understood, and the fact that Ludwig Pappe, Karl Zeyher and Peter MacOwan are among those who have controlled its destinies is a sufficient guarantee that a real effort was made to establish here a garden worthy of the name and of the place. And, indeed, the Cape Town Garden has in the past done a great deal in introducing exotic plants into cultivation. But those responsible for its management maintained a long but losing strife against unsuitable locality, poor soil, too limited space, lack of water, inadequate funds and the consequent grinding necessity of making the bulk of the income from the sale of produce. The functions of a Botanic Garden were swamped, and all pretence in this direction was finally abandoned in 1891 when it was taken over by the Municipality. It became, as MacOwan foretold, 'but a town pleasaunce of flowers and shady walks,' and, indeed, it could never have been anything greater. This purpose it fulfils admirably, and it is now, probably more than it ever was before, a credit to the

city and to the Corporation as to its curator, Mr. Ridley, whose skill in carrying out many recent improvements is deserving of all praise.

"Mention should also be made of two experiment stations recently established in the Transvaal. Skinner's Court in Pretoria, brought into cultivation as a forest nursery in 1902, became a garden for the experimental cultivation of economic plants in 1904. A second station of the same kind, with 25 acres under cultivation, was opened at Springbok Flats in the Waterberg district in 1903. Both these are therefore in their infancy, but so far as can be jndged from the available published information concerning them, they will perform some of the important functions of a Botanic Garden which have hitherto received little attention in South Africa."

The views of various botanists of note are then given as to the need of a properly constituted Botanic Garden among which some comments taken from the *Kew Bulletin*, 1892, pp. 10–14, on the occasion of the transfer of the Cape Town garden to the Municipality are reproduced.

Professor Pearson next proceeds to discuss what is meant by a Botanic Garden and what would be the numerous and complex functions it might be expected to perform in a country like South Africa—"a country in which the climatic and other factors affecting plant-life are so remarkably diversified; in which the native vegetation is of such exceptional interest; in which so little systematic effort has been expended in the experimental cultivation of native and exotic plants of ascertained or problematic economic value; in which such vast areas are awaiting utilization; in which the pastoral and agricultural pursuits, upon which the real prosperity of the new South Africa depends offer for solution so many problems of far-reaching economic importance.

"The foundation of all botanical investigation, as well as of all these researches into the problems of plant life which fall within the respective provinces of the chemist, the physicist, and the agriculturist, is a knowledge of the native vegetation. We have in South Africa a group of floral regions which are second to none in scientific interest. With the exception of a few areas, which are very small indeed in comparison with the greatness of the country as a whole, none of these has been thoroughly exploited by the plant-collector and the systematic botanist; and our knowledge of the plants of many extensive tracts is still hardly more than embryonic. From our present point of view the truth of these statements does not rest merely upon the fact that there are yet many South African species undescribed and unnamed. To complete the catalogue of South African species, not only of phanerogams but also of cryptograms, is an object eminently worthy of our best endeavours and, indeed, not less than a duty which we owe to ourselves and to the rest of the civilised world; but, when all this is done, we have still to learn the geographical range of each species and to obtain a comprehensive knowledge of the life-conditions which control its existence. This knowledge, full of interest as it would be for the student of plant-geography, also possesses a great practical value. Recent events have shown once more how great is our readiness to credit wild stories of the discovery of untold

mineral wealth, but, on the other hand, we are certainly too prone to believe that many parts of the country are worthless unless they contain marketable minerals. I doubt if such a pessimistic verdict with regard to any large area of the Union Territories is at present founded upon adequate evidence. A very important part of the *data* which alone can justify or controvert such a conclusion is furnished by the native vegetation. For such knowledge of it as we possess we are indebted primarily to the European collectors of the last century and a half, of whose names a South African scientific audience needs no reminder. These men bore the burden and heat of the day in a very real sense, and we who have entered into the fruits of their labonrs have not given that attention to the completion of their work which the needs of the present, as well as the traditions of the past, clearly demand from us. It is true that botanical exploration has not been allowed to die, but for this we must thank individuals—the few whose names will justly occupy prominent positions in the history of South African Botany, whose work has been ably supported and supplemented by the many working in quiet isolation, seeking and receiving no reward, stimulated only by a keen interest in the plants among which they live, who will, when everything is as it should be, be deemed worthy of greater honour than some whose names are more widely known. But what has been and still is lacking is the concentrated and organised effort which has its inspiration in a National institution. A South African Botanic Garden, established upon a sound basis would place on the front page of its programme the completion of the botanical exploration of the country. In this work it would seek to co-ordinate individual effort to which we already owe so much, with the official enterprise which till now has been almost non-existent. The scientific importance of this undertaking it would be difficult to over-estimate. That practical results would follow can hardly be doubted, but apart from these, an educated community must recognise that it is its duty to know the country in which it lives.

"Closely connected with this subject is the cultivation of indigenous plants. It may fairly be said that no other part of the earth's surface offers so great an array of forms of scientific and horticultural importance which lend themselves to inexpensive and effective treatment in a limited space. More than one of the authorities previously quoted have referred to the lack of interest shown in the native flora. People say, no doubt with much truth, that Cape plants are difficult to grow ; but the fact remains that a large number of them, and these by no means the most attractive, have at one time or another been successfully cultivated in Europe ; even to-day, when Cape plants are somewhat 'out of fashion,' you will find at Kew, at Dahlem and I believe also at Edinburgh, Vienna, and elsewhere in Europe, a greater variety of South African plants than in the gardens of the Cape itself. Hundreds of visitors touch at Cape ports, especially at Cape Town, during the year. They enquire times without number 'Where can we see the Heaths, the Proteas, the Orchids, the succulents, the bulbs and other constituents of the vegetation for which South Africa is famous the world over?' They are told 'You must climb Table

Mountain, wander over the Cape Flats and visit the Karoo, Namaqualand and the East; we fill our gardens with plants, very many of which you can see to better advantage in Europe, the States or Australia; our own vegetation which you are discerning enough to praise is difficult to grow.' The inheritors of one of the most remarkable and most beautiful of existing floras, we take so little interest in it that we have not yet been at the trouble to bring its treasures into cultivation! Such as we do find room for, we grow because the enterprise of European horticulturists has made them popular and, as a rule, we are content to be ignorant that we have but brought them back to their own country. This is surely not in harmony with the traditions of South African patriotism! A tardy recognition of a national duty has given rise to legislation designed to protect some of our more attractive and rarer plants from a threatened extinction, but we cannot stop here. The public taste must be stimulated to a proper appreciation of the æsthetic value of one of the most striking of the products of the country, and our duty as custodians of a unique vegetation—many of whose constituents have already disappeared, and others can with difficulty be saved—must be realised. These objects have been forwarded and to a large extent achieved in other countries by National Botanic Gardens, and a similar institution here, with the prestige of a Government Department, administered on scientific lines and accessible to the public would undoubtedly do much to remove what is at present a national reproach as well as a neglect of what might be an important commercial asset. Anyone who has seen Kew on a summer bank holiday does not need to be told that an institution of this kind is a valuable means of education. . . . .

"Before leaving the subject of the South African indigenous vegetation, attention should be drawn to the need for its study from an economic standpoint. South Africa, a country of Euphorbias, has done no experimental work designed to remove the difficulties which have prevented them from acquiring a commercial value as rubber plants. Of our native fibre-plants, medicinal, resinous, and poison plants, fodder plants, and others, we have very little exact knowledge. Here is a practically untouched field for the activities of a well-organised State department of Botany.

"A collection of plants under cultivation affords opportunities for investigating their structure and life conditions. I need hardly explain that science has not finished with a plant when it has been labelled and placed in a herbarium. In fact, this is only a necessary preliminary to the more intimate study of the living plant. Biologists everywhere are busy with many ramifications of the problem of life, and we are called upon to do our share in widening the boundaries of human knowledge. Investigations of this character very generally necessitate keeping the plants for longer or shorter intervals under close observation. This demands a garden equipped with experimental facilities and staffed by men trained to make use of them. This department of the work of a Botanic Garden is of the greatest scientific importance, and it is therefore incumbent upon a civilised community to foster it, apart from the possibility of any practical results that may emerge. Research is, or should be, undertaken with the single object of discovering truth, regardless of the consequences. These, however, may at any time assume a practical and

economic importance which no one has been less inclined to expect than the investigator himself. When the Abbot of Brunn crossed different varieties of peas in his monastery garden he and those who immediately followed him were so little conscious that his work possessed any practical value that it remained unnoticed, indeed forgotten, for more than thirty years. But within the last decade we have seen the rise of a great and influential school of Biologists, who, starting from the basis established by Mendel, have already shewn that, within certain limits, we have the power to produce new races of animals and plants with a precision almost equal to that of the chemist when he prepares hydrogen by combining zinc with sulphuric acid. The economic consequences thus arising out of Mendel's simple experiments in the early 'sixties' are immense, and their limits are not yet to be defined. Work on these lines is in progress in all parts of the world where there are biologists with the means of conducting suitable experiments. In South Africa, so far as I am aware, no serious efforts have been made in this direction, except in the Transvaal and recently at Robertson, under the Departments of Agriculture. But here is a branch of investigation whose influence upon industry is incalculable. An important part of the work of a National Botanic Garden would be the organisation and carrying on of investigations of this character, primarily, of course, with a view to South African requirements. In so doing, however, it would discharge a wider obligation, for it would bring South Africa into line with the rest of the civilised world.

"The introduction and acclimatisation of useful and ornamental exotics were recognised as an important function of a Botanic Garden when the Cape Town Gardens were established. A good deal has been done in this direction, but still more remains to be accomplished. The introduction of foreign plants into this country has been of a somewhat haphazard character, and much enthusiasm and expense, which might have produced beneficial results have been largely wasted. Many valuable exotics have come into the country, but no one knows what they are nor where they are, and there is not at present in South Africa a single organisation properly equipped for obtaining and furnishing the needful information concerning them, for submitting them to experiment to determine their local value, nor for maintaining a general oversight and direction of enterprise of this nature. It is hardly necessary to say that there is a risk in introducing a new plant from another region. It may prove itself to be a good servant, but there is always a possibility that, if it is not very carefully looked after, it may become a bad master. South Africa has had many opportunities of learning this. In order to eliminate dangers of this kind, and to ensure that the introduction of new plants is carried out with judgment and economy, and that suitable steps are taken to ascertain and to realise the economic value of the introduced plants under South African conditions, a national scientific institution commanding the confidence of the Agricultural community is required.

"It has been stated on a former page that the grazing industry presents for solution many problems which would receive attention from the staff of a Botanic Garden. Space does not allow me to deal with these in detail, but I must lay stress upon one of them—

a problem of the greatest importance to the future welfare of this great industry, and through it to the whole community. I refer to what is usually known as the 'deterioration of the veld.' That the feeding value of the vegetation in those parts of South Africa which have been long settled is decreasing is a general belief. It is not difficult to convince oneself that for certain areas at least this belief is well-founded. It is not too much to say that this is a question of the utmost gravity. Slight changes proceeding unheeded for long periods may produce results which would seem to be altogether incommensurate with the magnitude of the changes themselves. While it might be a comparatively simple matter to arrest the downward progress if proper remedial measures were applied in time, a stage is reached sooner or later when Science is powerless. There can be little doubt that many good grazing grounds have been unconsciously allowed to lapse into desert, and that many more are now moving in the same direction. It is imperative that we should ascertain exactly what is happening in these cases; until we know this we are as helpless as a medical man who is called upon to prescribe for a patient of whose symptoms he is ignorant. All we know at present is that the problem is one of great complexity. Its investigation will almost certainly demand the co-operation of the systematic botanist, the physiologist, the bacteriologist, and the chemist; at least, it is quite certain that it will not be mastered by any one of them alone. It is one of those problems which must engage the combined attention of the staff of a well-equipped Botanic Garden, and which is not likely to be solved until the Government is able to command the services of such a staff.

"Finally, there must be mentioned a subject which is of great interest both to the Agriculturist and the Grazier—viz., that of plant diseases. A large proportion of these are caused directly or indirectly by parasitic fungi. In a country which grows wheat, mealies, grapes and sugar cane, it is sufficiently well-known that some of these entail economic consequences of the most serious order. As a result of the close attention paid to these matters in Europe and America, our knowledge of plant diseases has advanced in recent years with great rapidity. What has South Africa done to cope with the diseases from which its Agriculturists have suffered so much? The Transvaal alone has realised the importance of this question and has appointed as an officer in the Agricultural Department a highly-qualified expert in Mycology, whose work has justified his appointment many times over. With this exception, no South African Government has made adequate provision for this work. The extended department of mycology which will no doubt result from the centralisation of Agricultural administration, would be most suitably and economically attached to the State Botanic Garden—suitably, because the work of the mycologist at many points touches that of the physiologist, the morphologist and the systematist, and each is benefited by the experience and knowledge of the rest; economically, because if the mycologist has a separate department of his own much of the laboratory, greenhouse, and garden space, as well as the library and equipment, must be duplicated.

"I have by no means reached the end of a reasonable catalogue of the activities of a properly organised National Garden, but I have still something to say on another aspect of the question, and cannot spare time to deal further with this one. But I think I have said enough to establish my second proposition—viz., that an abundance of work is awaiting the appearance of such an institution. This work has a strong claim upon a civilised and educated community; much of it is intimately concerned with the prosperity of the country, most of it will remain undone until the Government, realising its importance, supplies the means for doing it." . . . .

Professor Pearson then goes on to consider the question in greater detail and to discuss the ways and means of developing, on practical lines, a scheme such as he has outlined. For the scheme to be complete there must need be a Central Institution with various dependent stations which should follow as a natural growth with the development of the scheme.

"As integral parts of it, there will be: (1) A National Herbarium and Botanical Library; (2) a Museum of Economic Botany; (3) Research Laboratories; (4) Administrative Offices. So much centralisation is absolutely necessary both for administrative and scientific reasons. A good deal of the scientific work will, of course, be done in the field or at one or other of the smaller experimental gardens, but unless the whole system is to be paralysed by incomplete equipment and a diffuseness of purpose which take away all hope of efficiency, there must be for all purposes a common base of operations. As to the Garden itself, it will naturally be larger than any of the others and its functions more comprehensive. In the first place, it will become a school of South African Horticulture—a school in a twofold sense. South Africa has not yet evolved a South African Garden. The National Garden will seek to justify its title; it will gradually discover what can be done with the forms which Nature has so bountifully bestowed upon South Africa, and which have hitherto been so pointedly neglected in the country of their origin. It will teach those who visit it to know their own, and it will become a pleasing object-lesson of the great truth which South Africa has not yet finished learning—that the true springs of her development are within, and not oversea. It will also be a school of South African gardening of another kind, for it will train South African gardeners under South African conditions." . . . .

The question as to the proper site for such a National Garden is one with which competent authorities in South Africa are alone competent of dealing, though one suggestion discussed by Professor Pearson possesses an intrinsic interest which justifies its reproduction here.

"One cannot, however, pass by in silence the suggestion which has been made more than once, that the Groote Schuur estate possesses many striking advantages as a Botanic Garden site. It is historic ground and in the eyes of the public is not merely a perpetual memorial of a great man, but it stands for a great ideal whose realisation would be brought nearer by the influences which would emanate from a National Garden, adequately

equipped to carry out the work which belongs to such an institution. It has been said that the idea of establishing a National University in Groote Schuur is favourably entertained by the Government. If this be so, what could be more appropriate than that these two national institutions, designed to raise the standard of culture and to contribute to the material prosperity of the South African nation, should both be overlooked by the Rhodes Memorial? The direct or indirect association of University and Botanic Garden is nothing new: it has endured for centuries in many European centres of learning. As an aid to education—not merely the acquisition of botanical knowledge—the Botanic Garden is an invaluable asset to a University and, on the other hand, the staff of a University Botanical Department can contribute very effectively to the research work carried on in the Botanic Garden." . . . . .

After dealing with some aspects of the financial questions which the realisation of the proposal would involve, Professor Pearson concludes his address in the following words:—"The economic value of a State Department of Botany organised upon a scientific basis and provided with adequate equipment has been abundantly proved in all other important parts of the Empire, tropical, sub-tropical, and temperate. What is probably the most efficient Botanic Garden at present existing is maintained by the Dutch in Java; and perhaps the most beautiful by the Republic of Brazil at Rio de Janeiro. The occupation of the Philippines by America has immediately resulted in a great development of botanical enterprise in those islands. The continent of Africa is dotted with Gardens maintained, partly or entirely for economic purposes, by Egypt, Germany, Portugal and Great Britain. The accumulated wisdom of the nations has found no other satisfactory means of doing the work for which these gardens are established. If South Africa is to proceed upon what, by common consent, are the soundest and most direct lines in increasing, developing and preserving her agricultural and pastoral resources, she must follow the example set by other nations in the occupation or settlement of new or incompletely known regions.

"Important as the commercial aspect of this question undoubtedly is, South Africa cannot ignore another consideration which does not exist in certain of the cases referred to above, where a new country has no immediate prospect of becoming the permanent home of a people of European origin. The South African Botanic Garden cannot be merely an economic undertaking; it must also be an expression of the intellectual and artistic aspirations of the New Nation whose duty it is to foster the study of the country which it occupies, to encourage a proper appreciation of the rare and beautiful with which Nature has so lavishly endowed it."

LV.—DECADES KEWENSES.

Plantarum Novarum in Herbario Horti Regii Conservatorum.

DECAS LIX.

581. **Cerastium unalaschkense**, *Takeda* [Caryophyllaceae-Alsineae]; species *C. robusto*, Williams, affinis, a quo differt foliis plus duplo brevioribus, petalis oblanceolatis calycem $\frac{1}{3}$ superantibus nec obovatis calyce fere duplo longioribusque, pedicellis deflexis nec erectis, seminibus majoribus, tuberculis ad marginem quam in disco majoribus, longe-echinatis.

Caulis robustus, ut videtur ultra pedalis, simplex, dissite foliatus, pilis rigidulis ferrugineis eglandulosis patentibus hirsutissimis. *Folia* inferiora ovato-lanceolata, superiora ovata, acuta, utrinque pilis longis rigidis eglandulosis hirsuta. *Dichasium* 3–13-florum; pedicelli crassi, fructiferi omnes excepto centrali erecto-patulo deflexi, calyce subduplo longiores, apice paulo curvati, dense hirsuti; bracteae infimae saepe foliaceae, superiores minores, lanceolatae, herbaceae, hirsutae. *Sepala* lanceolata, acuta, 1 cm. longa, margine scariosa, dorso hirsuta. *Petala* oblanceolata, calycem $\frac{1}{3}$ superantia, quadrante bifida, basi ciliata. *Capsula* calyce duplo longior, recta, dentibus rectis, obtusis. *Semina* compresso-subglobosa, 1·3 mm. longa, nigrescenti-ferruginea, dense tuberculata, ad marginem longe-echinata.——*Cerastium vulgatum* γ. *macrocarpum*, Fenzl in Ledeb. Fl. Ross. i., p. 409.——*Cerastium alpinum* β. *Fischerianum* lus. *macrocarpum*, Regel, Pl. Radd. i., p. 439.

Eastern Siberia. St. Laurence Bay, spec. ex herb. hort. Mus. Petrop. 1837, s. n. *C. rigidi.*

Aleutian Islands. Unalaschka, *Eschscholtz*; *M. W. Harrington*, 1871–72.

As a species named *C. macrocarpum* exists, I have named my plant *C. unalaschkense.* It is quite different from *C. vulgatum* or *C. alpinum* by the characters described above.

582. **Cerastium Wilsonii**, *Takeda* [Caryophyllaceae-Alsineae]; *C. rigido*, Ledeb., affine, sed planta glabrescens, foliis ovalibus abrupte vel subapiculato-acuminatis, sepalis apice leviter bilobis, petalis late-cuneatis, lobis angustatis profunde bifidis, staminibus calycem paulo superantibus, petalisque basi glabris distinguenda.

Perenne. *Caulis* ultrapedalis, glabrescens. *Folia* inferiora spathulata, basin versus valde attenuata, abrupte acuminata, superiora ovalia, subapiculato-acuminata, tenuia, glabra, ad nervis tantum et ad bases pilosula. *Dichasium* multiflorum, ramis longe-pedunculatis, glanduloso-hirsutis; pedicelli subfiliformes, glanduloso-hirsutuli, centrales fructiferi calyce fere quadruplo longiores, erecto-patuli, apice incurvi; bracteae infimae foliaceae, acuminatae, supremae multo minores, subscariosae, parte herbacea pilosae. *Sepala* lanceolata vel late-lanceolata, obtusa, apice leviter biloba, margine scariosa, dorso glanduloso-hirta, circiter 6 mm. longa. *Petala* calycem duplo superantia, late-cuneata, dimidio bifida, lobis anguste ellipticis, acutiusculis, basi glabra. *Stamina* calyce paulo longiora, basi glabra. *Capsula* submatura calycem $\frac{1}{2}$ (demum

duplo ?) superans, paulum curvata, dentibus rectis obtusis. *Semina* subtriangulari-globosa, compressa, ferruginea, dense tuberculata, diametro 1 mm. vel paulo ultra.

CENTRAL CHINA. W. Hupeh, *E. H. Wilson*, 259.

583. **Indigofera Lacei**, *Craib* [Leguminosae-Galegeae] ; affinis *I. nigrescenti*, Kurz, sed ramis albo-tomentellis, racemis folia longe superantibus, bracteis persistentibus, leguminibus glabris longioribus differt.

Suffrutex ad 2 m. altus ; rami sulcati, juventute albo-tomentelli, mox glabri, cortice brunneo. *Folia* petiolis 5 mm. longis suffulta, 7–9 cm. longa ; stipulae filiformes, circiter 6 mm. longae ; foliola circiter 23, opposita, oblongo-elliptica vel elliptica, apice rotundata vel leviter emarginata, mucronata, basi rotundata vel interdum cuneata, ad 1·5 cm. longa et 7 mm. lata, rigide chartacea, margine integro, nervis lateralibus subtus conspicuis intra marginem arcuatis ; petioluli circiter 1 mm. longi ; stipellae minutae, setaceae. *Racemi* axillares, multiflori, pedunculo 2·5 cm. longo suffulti, 17·5–22·5 cm. longi. *Pedicelli* graciles, ad 4 mm. longi ; bracteae persistentes, ad 3 mm. longae, ante anthesin haud conspicuae. *Calyx* 1 mm. longus, dentibus minutis. *Corolla* purpurea, longe exserta, ad 8 mm. longa. *Legumen* vix maturum, glabrum, compressum, apice acutum, ad 3 mm. longum, 2 mm. latum, suturis prominentibus, valvis brunneis reticulatis.

INDO-CHINA. Burma : Maymyo Plateau, 1050 m., *Lace*, 4268.

584. **Swainsona Incei**, *Price* [Leguminosae-Galegeae] ; species ex affinitate *S. phacifoliae*, T. Muell., sed stylo praeter faciem interiorem pilosam paulo post stigma penicillato-barbato differt, etiam *S. parviflorae*, Benth., comparanda, sed stylo firmo applanato distincta.

Herba annua (an semper ?), pilis albis laxe induta ; caulibus rigidis. *Folia* 3- (rarius 2-) juga, cum petiolo 2·5–3·5 cm. longo ad 10 cm. longa, foliolis oblongo-lanceolatis vel anguste lanceolatis acutis vel obtusis vel subemarginatis mucronato-apiculatis leviter hirsutis supra glabrescentibus, stipulis integris e basi ovata caudato-attenuatis. *Racemi* 8–21-flori, ad 12 cm. longi, axillares, longe pedunculati, pedicellis brevibus, bracteolis linearibus paulo a calyce remotis. *Calyx* pilis albis subtomentoso-hirsutus, 5 mm. longus, lobis triangularibus seu lanceolatis-acuminatis tubo aequilongis. *Corolla* caeruleo-violacea, vexillo emarginato 1·5 cm. lato callis nullis, alis carina multo brevioribus, carina obtusa incurva. *Ovarium* sessile, dense villosum. *Stylus* distincte applanatus, firmus, incurvus, praeter faciem interiorem pilosam paulo post stigma penicillato-barbatus. *Fructus* deest.

WEST AUSTRALIA. Probably Mt. Sir Samuel, *W. H. Ince*.

585. **Rubus (Idaeobatus) adenophorus**, *Rolfe* [Rosaceae-Rubeae] ; a *R. chiliadeno*, Focke, caulibus crassissimis, foliis ternatis et racemis brevibus differt.

Caules crassissimi, armati ; ramuli florentes hirti, glandulis stipitatis inaequalibus longis atropurpureis aculeisque sparsis muniti. *Folia* ternata vel supera rarius simplicia ; stipulae e basi petioli enatae, filiformes, hirsutae ; petioli hirti glandulosique, parce aculeati, 3–6 cm. longi ; foliola inaequaliter et duplicato-crenata,

utrinque viridia et hirta ; foliolum terminale cordato-ovatum, subobtusum, interdum sublobatum, 4–7 cm. longum ; foliola lateralia subsessilia, minora. *Racemi* ad apices ramulorum, breves, 3–4 cm. longi, 6–10-flori. *Rachis* cum pedunculis sepalisque hirta glandulisque atropurpureis ornata. *Pedicelli* 0·5–1 cm. longi. *Sepala* triangularia, acuminata, circiter 6 mm. longa, patentia. *Petala* late unguiculata, circiter 5 mm. longa ; limbus late ovato-orbicularis, crenulatus, roseus. *Stamina* numerosissima, 3 mm. longa. *Styli* 3 mm. longi, basi pilosi. *Fructus* 1 cm. lati, nigri, edules ; drupulae parce pilosae, nitidae ; putamen minute rugulosum.

China. *Wilson*, 81.

A very distinct species which flowered at Kew in July, 1910, and fruited a few weeks later. It is allied to *R. chiliadenus*, Focke, and closely resembles it in the development of the glands. That species, however, has slender branches, much more elongated serrate leaflets, which are often quinately pinnate, and a loose paniculate inflorescence. The glandular development much resembles that of the *Glandulosi* of the *R. hirtus* group, as pointed out by Focke, and so strongly developed are the glands in *R. adenophorus* that in the living state the sepals recall a pincushion stuck full of black-headed pins. This glandular development extends to the stems and petioles. The Wilson number quoted is the one under which the plant was received from the Arnold Arboretum.

586. **Alloplectus (Nautilocalyx) Forgetii**, *Sprague* [Gesneriaceae-Cyrtandreae] ; affinis *A. Lynchei*, Hook. f., a quo foliis longius petiolatis basi anguste subtruncatis margine crispato, petiolis villosis recedit.

Herba e basi ramosa, circiter 6 dm. alta, caulibus pluribus erectis teretibus carnosis breviter villosis superne 8–9 mm. diametro, internodiis 6–8 cm. longis. *Folia* opposita, lanceolata, breviter acute acuminata, basi anguste subtruncata, 13·5–16·5 cm. longa, 5·5–6·5 cm. lata, margine crispata, crenata, sparse ciliata, subcarnosa, supra nitidula, viridia, glabra nervo medio sparse piloso excepto, nervis impressis, subtus opaca, in utroque latere nervorum purpurata, ceterum pallide viridia, nervis prominentibus, nervo medio breviuscule sparse patule villoso, nervis lateralibus utrinque 11–14 ut venulis appresse pilosis, mesophyllo glabro ; petioli 3·5–5 cm. longi, plano-convexi, villosi praecipue in aciebus. *Cymae* contractae, instar fasciculorum, axillares, sessiles, 6–9-florae, bracteis duabus transversis ascendentibus lanceolatis acutis 1·5–2 cm. longis ciliatis extus sparse pilosis intus glabris ; cymula centralis primum evoluta, 3–4-flora ; cymulae laterales 1–3-florae, basi bracteis duabus antico-posticis suffultae ; pedicelli sub anthesi 1·5–1·8 cm. longi, villosi, demum elongati. *Calyx* zygomorphus ; segmenta libera, ovato-lanceolata, acutiuscule acuminata, basi rotundata, 1·6–1·7 cm. longa, 6·5–7 mm. lata, tenuia, hydathodiis denticulata, sparse ciliata, extus sparse pilosa, intus glabra ; segmentum posticum calcare corollae basi repulsum, valde curvatum. *Corolla* ascendens, pallide flava, dorso calcarata ; tubus calcare incluso 3–3·2 cm. longus, extus crispule villosus, intus antice glaber, postice pilis minutis glanduloso-capitatis indutus, inferne 4·5 mm. diametro, circiter 1 cm. supra basin calcaris ampliatus, abhinc usque ad os 8–9 mm. latus, a dorso usque ad ventrem circiter 7·5 mm. metiens ; calcar amplum, rotundatum, circiter 3 mm. longum ;

lobi patuli, transverse elliptici, 5–6 mm. longi, duo laterales exteriores, extus breviter villosi. *Filamenta* in vaginam postice fissam corollae tubo adnatam connata, superne antheris disjunctis spiraliter torta, antica longiora, vagina antice 5 mm. longa, lateraliter 4 mm. longa. *Antherae* per paria apicibus connectivorum connata, circiter 2·2 mm. longa, connectivo dorso valde incrassato 1·7 mm. longo 0·8 mm. lato, 0·6 mm. ultra loculos prominente, loculis omnino sejunctis parallelis mytiliformibus introrsum per totam longitudinem dehiscentibus, triente inferiore libero. *Disci glandula* unica, postica, 1·5–1·7 mm. alta. *Ovarium* ovoideum, 3 mm. longum, pilis multicellularibus acutissimis breviter villosum, superne purpurascens ; stylus circiter 2 cm. longus, pilis multicellularibus aliis glanduloso-capitatis aliis paucioribus acutissimis patule hirsutus ; stigmatis lobi intus minute glanduloso-pilosi ; placentae ad basin bipartitae, segmentis plano-convexis introrsum (facie convexo) tantum ovuliferis.

Peru. Collected by *Forget* for Messrs. Sander & Sons, St. Albans, by whom a plant was presented to Kew.

A. Forgetii is congeneric with *Centrosolenia bractescens*, Hook. Bot. Mag. t. 4675, *Alloplectus Lynchei*, Hook. f. Bot. Mag. t. 7271, and *Episcia hirtiflora*, Spruce ex Hanst. in Mart. Fl. Bras. vol. viii. pars. 1, p. 402. These species and some others constitute a very natural group which may be regarded either as a distinct genus, *Nautilocalyx*, Linden, or as a section of *Alloplectus* for which the name sect. *Nautilocalyx*, Sprague, may be used. The group differs from *Episcia* in habit, shape of corolla, and in the placental lamellae bearing ovules on the inner surface only.

587. **Pityrodia flexuosa**, *Price* [Verbenaceae-Chloantheae] ; affinis *P. Bartlingii*, Benth., et aliis speciebus sectionis *Chloanthopsis*, Diels ; a ceteris speciebus *Pityrodiae* antheribus haud appendiculatis, ab omnibus ramulis superioribus tenuibus glabrescentibusque, floribus minoribus distinctissima.

Fruticulis ramosus, erectus, omnino albus seu canus, dense lanatus ; internodiis superioribus elongatis tenuiter flexuosis brunneo-purpureis glabrescentibus. *Folia* ovato-oblonga, obtusa, sessilia, sed non decurrentia, utrinque alte rugosa, marginibus minute et aequaliter crenata, interdum sparsim floccosa. *Flores* numerosi, in cymas globosus dense albo-lanatas circiter 2·5–3 cm. distante aggregati, parvi, ad 1 cm. longi. *Calyx* fere ad basim divisus, segmentis linearibus 5 mm. longis dorso pilosissimis. *Corolla* 8 mm. longa, bilabiata, lobis patentibus, tubo 5 mm. longo subcylindrico in calyce incluso. *Stamina* exserta, summo tubo orta, antheri ovalibus, loculis parallelis haud appendiculatis. *Ovarium* stylusque admodum albo-tomentosa.

West Australia. *W. H. Ince.*

588. **Scleria Kerrii**, *Turrill* [Cyperaceae - Sclerieae] ; affinis *S. Radulae*, Hance et *S. elatae*, Thwaites, ab illa nuce pubescente, foliis haud longe attenuatis, ab hac nuce haud tessellata, foliis latioribus haud longe attenuatis differt.

Rhizoma lignosum, crassum, squamis dissolutis obtectum. *Culmi* robusti, ad 8 dm. alti, glabri, triquetri, foliosi. *Folia* 5–7 ; vaginae trialatae, purpurascentes saltem ad angulos ; laminae late lineares vel lineari-lanceolatae, subacutae, usque ad 22 cm. longae, 2·4 cm. latae, in marginibus scabris, nervis primariis 3, glabrae. *Panicula*

ad 7 cm. longa, 6 cm. lata, densa ; rhachis fere glabra ; bracteae primariae infimae foliaceae, superiores et secundariae 1–4·5 cm. longae, lineares, scabrae. *Spiculae* numerosae, unisexuales, foemineae et masculae in panicula mixtae ; spiculae ♂ 4 mm. longae, 1 mm. latae, ♀ 5–6 mm. longae ; glumae mucronatae, pallescentes, marginibus atrorubris. *Stylus* trifidus, 3 mm. longus, ramis 5 mm. longis. *Discus* trilobatus, 1 mm. altus. *Nux* alba, nitida, ovoideo-globosa, breviter apiculata, minute pubescens, non tessellata.

INDO-CHINA. Siam : Chiengmai, Doi Sootep, *Kerr*, 1239.

589. **Carex plesiocephala**, *Turrill* [Cyperaceae-Caricoideae] ; affinis *C. Delavayi*, Franch., sed spiculis 2 approximatis, bracteis haud vaginantibus, utriculis minoribus dense albo-tomentosis ad angulos non alatis rostris longioribus facile distinguenda.

Rhizoma horizontaliter elongatum, vaginis vetustis in fibrillas nigras solutis dense obtectum. *Culmi* usque ad 35 cm. alti, triquetri, ad angulos scabri, superne pilosi. *Folia* pleraque basalia, culmum saepe aequantia, ad 30 cm. longa, 1 cm. lata, plana, marginibus minute scaberrimis, apice acutissima, glaucescentia. *Spiculae* saepissime 2 (rarius 1) androgynae, approximatae, sessiles, 6–7 mm. longae, 0·5–1 cm. latae, parte ♂ quam ♀ parum longiore ; bracteae haud vaginantes. *Flos* ♂ : squamae lanceolato-ovatae, acutae, 4·5 mm. longae, 1·5 mm. latae, minute pilosae ; stamina 3. *Flos* ♀ : squamae oblongo-ovatae, longe mucronatae, 5 mm. longae, 2 mm. latae, minute pilosae ; utriculi squamas parum superantes, oblique patentes, ovoidei, subtrigoni, 5 mm. longi, 1·3 mm. in diametro, ad angulos non alati, dense albo-tomentosi, in rostrum longiusculum, ore bidentatum attenuati. *Styli* basis incrassata ; stigmata 3. *Nux* ovoidea, acute trigona, faciebus concavis.

INDO-CHINA. Burma : Upper Chindwin District, Vindat, 150 m., *Lace*, 4235 ; Siam : Chiengmai, Doi Sootep, *Kerr*, 1221.

590. **Oxytenanthera Lacei**, *Gamble* [Gramineae - Bambuseae] ; affinis *O. Thwaitesii*, Munro, sed vix scandens, spiculis 2-floris, cataphyllis brevioribus haud ita conspicue auriculatis, et foliis tenuioribus.

Frutex erectus. *Culmi* virides vel viridi-glaucescentes, fistulosi, laxe ad basin fasciculati, ramis foliiferis duris ultimis non fistulosis, ramis floriferis fistulosis vel solidis teretibus. *Cataphylla* culmorum 20–30 cm. longa, 15–20 cm. lata, ad basin 4–6 cm. lata, ad apicem straminea, conspicue striata, dorso in parte superiore dense spinulis nigrescentibus tecta ; lamina subulato-lanceolata, reflexa, 10–30 cm. longa, basi paulla contracta, et inde utrinque auriculis brevibus plicatis fimbriatis instructa ; ligula circa 5 mm. longa, ore longe fimbriata. *Folia* tenuia, pallida, in ramis gracilibus geniculatis fasciculatis alternatim ex nodorum lateribus in ramis foliiferis dispositа ; vaginae stramineae, striatae, dorso spinulis albis munitae, ore auriculis longis sparse sed longe-fimbriatis cito deciduis instructae ; laminae 10–20 cm. longae, 1–2 cm. latae, supra scaberrimae, infra pubescentes, marginibus etiam scabris, apice acuminatissimae, basi subcordatae, nervis utrinque 5 infra conspicuis ; ligulae breves, membranaceae, dentatae. *Flores* in culmis floriferis in glomerulis ad nodos ramorum 20–40 cm. longorum ad nodos alternatim

fasciculatorum ; glomeruli circa 2 cm. diametro, ad 10–12 spiculas fertiles cum multis sterilibus minoribus et bracteis paleaceis ferentes ; spiculae 5–7 mm. longae, glaberimae, basi bracteis 1–3 parvis suffultae ; glumae vacuae 2–3, ovatae, mucronatae, inferior 3 mm., superior 4–5 mm. longae ; flores fertiles 2 ; glumae florentes (valvae) ovatae, longe mucronatae, floris inferioris 6 mm. longae, superioris 8 mm. longae ; palea floris inferioris bicarinata, carinis ciliatis, apice marginata, 5-nervis, floris superioris convoluta, glabra, apiculata. *Stamina* purpurea ; juniora subsessilia, libera, vetustiora filamentis in tubum longissimum exsertum coalitis ; antherae lineares, apice mucronatae. *Ovarium* ovato-lanceolatum, in stylum gracilem pubescentem attenuatum. *Caryopsis* ignota.

INDO-CHINA. Burma : Thatone District ; E. of Salwen river, Hlaingbwe Forest Reserve and Melaung, *J. H. Lace*, 4578, 4584.

LVI.—LEPTODERRIS, A NEW GENUS OF LEGUMINOSAE.

S. T. DUNN.

In 1860 Bentham described two leguminous climbing shrubs collected by Heudelot in Senegambia as *Lonchocarpus ? fasciculatus* and *L.* ? *brachyptera*, remarking that they differed from all other species of the genus known to him in their stiff, narrow standard and narrow calyx. These and three more plants of similar habit, and possessing the same peculiarities of floral structure, were included by Baker in the genus *Derris* in his account of the *Leguminosae* in the Flora of Tropical Africa in 1871. Three more have been described since that date, one as a *Lonchocarpus* and two as *Derris*. These eight species and six more, described for the first time in this paper, are distinguishable at a glance from all other species of *Derris*, *Lonchocarpus* and *Millettia* by reason of their conspicuously crowded racemes of narrow flowers.

These genera as at present defined are distinguished with certainty only when quite ripe fruit is available, and as the species referable to them collectively are very numerous but usually unknown in ripe fruit, considerable confusion has resulted. Certain marked types of inflorescence and floral structure are observable among them, and it has been in the matching of flowering specimens with these types that the greater part of the confusion has arisen. It has therefore become a matter of pressing importance that any distinct and self-contained groups distinguishable from all allied ones even in the absence of fruit, should be extricated from these genera and given separate generic status. The present paper represents a step in this direction. These 14 species, which are all African, are so closely allied in the characters of their flowers and inflorescence, and are so distinct from all other known species of those genera even when the ripe fruit is unknown, that they form a compact and uniform generic group, and it is proposed to extricate them from the overburdened genera to which they have been previously referred and to treat them as a new genus under

the name of *Leptoderris*. The fruit is that of *Derris* and the name refers to this fact and to the circumstance that the genus has narrow petals and calyces.

This being a natural and uniform genus as regards the floral and (where known) the fruiting characters, some light is thrown upon the value for purposes of generic segregation, in this part of the Natural Order, of other characters, such as the presence or absence of stipellae and of callosities or auricles at the base of the standard. Both these characters vary considerably in this genus, being in fact, only of importance in distinguishing small groups of species, and appear to be here only of secondary taxonomic importance.

All the species inhabit Western Tropical Africa, with the exception of *L. Kirkii* and *L. Harmsiana* which come from the eastern region and *L. calva* which is a native of Uganda.

By the courtesy of the Director of the Royal Botanic Gardens, Kew, this paper has been prepared in the Kew Herbarium and the specimens referred to are there, with the exception of the fine set of Welwitsch's Angola plants preserved at the British Museum Herbarium, leave to examine which and some other material was kindly given by the Keeper of that Department.

Leptoderris, *Dunn*, gen. nov. [Leguminosae-Dalbergeae]; affinis *Derrei*, Lour., sed floribus dense nodoso-racemosis, calyce anguste campanulato, vexillo angusto, cymbiformi, haud reflexo differt.

Calyx anguste campanulatus, sericeus, dentibus brevibus 4, uno bidentulato. *Petala* glabra. *Vexillum* anguste oblongum, cymbiforme, erectum vel patens, rigidum, laminae basi plana vel callosoauriculata. *Alae* oblique oblongae, carinae supra unguem leviter adhaerentes. *Carina* parum incurva, petalis dorso cohaerentibus. *Stamina* monadelpha, vexillari basi caeteris soluto autem vexilli ungui plus minusve adhaerente. *Antherae* versatiles. *Ovarium* sessile 2–(1 vel 3) ovulatum, pubescens. *Stylus* filiformis, incurvus; stigmate parvo terminati. *Legumen* oblongum, planum, membranaceum, indehiscens, stylo terminali; sutura superiore alata. *Semina* 1–(vel 2) planocompressa.

Frutices scandentes vel raro erecti. *Folia* alterna imparipinnata; foliolis oppositis saepe retusis. *Flores* in ramis paniculae dense nodoso-racemosi. *Bracteae* parvae caducae; bracteolae ovatae vel subulatae, parvae.

Species 14, Africae tropicae incolae.

Clavis specierum.

Foliola matura subtus sericea vel saltem in venis tomentosa
  Foliola subtus adpresse argenteo-sericea ... 1. *L. hypargyrea.*
Foliola subtus tomentosa
  Foliola supra opaca, membranacea, non reticulata
    2. *L. brachyptera.*
  Foliola supra nitentia, coriacea vel chartacea, infra reticulata
    Foliola subsessilia ... ... 3. *L. Goetzei.*
    Foliolorum petioluli 4 mm. vel longiores
      Tomentum calycis paniculaeque longum squarrosum
        4. *L. Kirkii.*

Tomentum breve densum
Nodi floriferi lineares ad 1·2 cm. longi
5. *L. Harmsiana.*

Nodi breves
Foliola acuta ... ... 6. *L. nobilis.*
Foliola obtusa vel retusa
Foliola subtus ubique tomentosa
Foliola apice rotundata ... 7. *L. micrantha.*
Foliola apice retusa, flores 1·2 cm. longi
8. *L. reticulata.*
Foliola subtus in venis tantum tomentosa
Panicula ad apicem ramosa 9. *L. congolensis.*
Panicula inferne tantum ramosa
10. *L. glabrata.*

Foliola matura glabra
Foliola venis 4–5-paribus ... ... 11. *L. fasciculata.*
Foliola venis 7–8-paribus
Flores 8 mm. longi
Foliola parva, 5–6 cm. longa, basi rotundata
12. *L. nyanzae.*
Foliola magna, basi cuneata ... ... 13. *L. calva.*
Flores 1·2 cm. longi ... ... 14. *L. macrothyrsa.*

1. **L. hypargyrea,** *Dunn*; affinis *L. brachypterae*, Dunn, sed foliolis subtus argenteo-pubescentibus ab illo et ceteris generis speciebus differt.

Frutex scandens? ramis et rachidibus foliorum paniculaeque tenuiter tomentosis. *Folia* bijuga, 15–20 cm. longa; foliola late cuneata, apice obtusa vel truncata, apiculata, ad 10 cm. longa, chartacea, venis exceptis supra glabra, nitentia, subtus adpresse argenteo-sericea, venis 8-paribus ascendentibus rectis parallelis subtus prominulis; petiolulis 0·8–1 cm. longis, stipellis obscuris vel 0. *Panicula* terminalis, ramis paucis longis. *Flores* dense nodoso-racemosi, nodis 2–5 mm. longis, pedicellis 3 mm. longis. *Calyx* anguste campanulatus, 3 mm. longus, lobis parvis triangularibus 4, sicut pedicellus adpresse sericeus. *Petala* glabra, 8–9 mm. longa. *Vexillum* anguste oblongum, cymbiforme, exauriculatum. *Stamen* vexillare basi liberum vexilli ungui adhaerens. *Ovarium* 2-ovulatum, sericeum.

Derris hypargyrea, Harms MS.

W. Tropical Africa. Kamerun: Bipinde forest, *Zenker*.

2. **L. brachyptera,** *Dunn*. *Lonchocarpus brachypterus*, Benth. in Journ. Linn. Soc. iv. Suppl. (1860), 100; *Derris brachyptera*, Baker in Oliver, Fl. Trop. Afr. ii. (1871), 246; Wildem. in Ann. Mus. Congo, sér. 5, i. (1904), 149; *Pterocarpus brachypterus*, O. Kuntze, Rev. Gen. Pl. i. (1891), 203; *Deguelia brachyptera*, Taub. in Bot. Centralbl. xlvii. (1891), 387.

W. Tropical Africa. Senegambia, *Heudelot*, 828; Congo (fide *Wildem.*); Angola, *Welwitsch*, 1889.

There seems to have been some doubt as to whether the specimens with more coriaceous reticulate leaflets are an older stage of the above, but Welwitsch's beautiful series at the British Museum Herbarium makes it clear that the membranous character of the leaflets of the above species is retained until full maturity.

3. **L. Goetzei**, *Dunn*. *Derris Goetzei*, Harms in Engl. Jahrb. xxx. (1901), 330.

Central Africa. Nyasa region (fide *Harms*).

The description of this species, specimens of which have not been seen, leaves no doubt that it belongs to this genus, but its relations with *L. brachyptera* are not quite clear. It is provisionally placed next to that species in the key.

4. **L. Kirkii**, *Dunn;* affinis *L. brachypterae*, Dunn, sed foliolis subcordatis brevi-petiolulatis, rachide foliorum glabra, paniculae tomento laxo distincta.

Frutex scandens. *Folia* bijuga, 25 cm. longa, rachide glaberrima; foliola ovata, apice obtusa vel truncata, basi rotundata subcordata, ad 10 cm. longa, margine revoluto, coriacea, supra glabra nitentia, subtus tenuiter laxe tomentosa, venis 6–8-paribus subtus prominulis; petiolulis 4 mm. longis, stipellis 0. *Panicula* terminalis, ad apicem pauciramosa, ramis rachideque laxe squarrose tomentosis. *Flores* dense nodoso-racemosi, pedicellis 1–2 mm. longis, bracteolis parvis lanceolatis. *Calyx* anguste campanulatus, sicut rami tomentosus, lobis parvis triangularibus 4, 4–5 mm. longus. *Vexillum* anguste oblongum, cymbiforme, bicallosum, fortiter auriculatum, stamini vexillari per totam unguem adhaerens, 1·2 cm. longum. *Ovarium* sericeum, 2-ovulatum.

Derris Kirkii, Dunn MS.

E. Tropical Africa. Zanzibar: Mafia Island, *Kirk*.

5. **L. Harmsiana**, *Dunn*; affinis *L. brachypterae*, Dunn, sed floribus minoribus nodisque floriferis elongatis distincta.

Frutex scandens?; ramulis foliis in pagina inferiore panicula calycibusque pube brevi densa tomentosa vestitis. *Folia* ad 35 cm. longa, bijuga; foliola obovata, apice rotundata vel truncata, basi obtusa, ad 12 cm. longa, coriacea, supra glabra nitida, venis 5–6-paribus subtus prominulis; petiolulis 5 mm. longis, stipellis persistentibus. *Panicula* terminalis, 30–40 cm. longa, inferne ramosa, nodis floriferis ad 1·2 cm. longis. *Florum* pedicelli 2 mm. longi. *Calyx* anguste campanulatus, 3 mm. longus, dentibus 4 brevibus triangularibus. *Vexilli* lamina oblonga, basi callose sulcata auriculis parvis involutis, cum ungui 9 mm. longa. *Ovarium* sericeum, 1–2-ovulatum.

Derris Harmsiana, Dunn MS.

W. Tropical Africa. Usambara: Derema, *Scheffler*, 170.

6. **L. nobilis**, *Dunn*. *Derris nobilis*, Welw. ex Baker l.c. 245; Wildem. l.c. 149; *Pterocarpus nobilis*, O. Kuntze l.c. 203; *Deguelia nobilis*, Taub. l.c. 387; Hiern, Cat. Welw. Afr. Pl. i. (1896), 283.

W. Tropical Africa. Congo (fide *Wildem.*); Angola, *Welwitsch*, 1890, 1891; Angola, *Gossweiler*, 1746.

7. **L. micrantha**, *Dunn;* affinis *L. glabratae*, Dunn, sed foliorum pagina inferiore ubique tomentosa floribusque minoribus siccitate purpureis nec albidis diversa.

Frutex scandens; foliorum pagina superiore petalisque exceptis ubique tomento brevi denso vestita. *Folia* bijuga, ad 15 cm. longa; foliola obovata, apice rotundata, apiculata, basi obtusa vel

truncata, ad 18 cm. longa, chartacea, venis 7-paribus subtus prominulis; petiolulis 4 mm. longis, stipellis parvis mox deciduis. *Paniculae* ex parte inferiore rami, paucae, longae. *Flores* dense nodoso-racemosi, nodis omnibus parvis 1–3 mm. longis, bracteolis subulatis 1–2 mm. longis. *Calyx* anguste campanulatus, 1–2 mm. longus, lobis 4 parvis triangularibus. *Vexilli* lamina oblongo-lanceolata, exauriculata, cymbiformis. *Carina* in siccitate purpureo-venosa. *Ovarium* 2-ovulatum.

W. Tropical Africa. Lagos: Ijero, *Millen*.

8. **L. reticulata**, *Dunn*; affinis *L. congolensi*, Dunn, sed foliolis subtus in venis tomentosis reticulatis differt.

Frutex scandens ?; foliis paniculaeque ? ramis tantum visis. *Folia* bijuga, 20–30 cm. longa; foliola cuneato-obcordata, apiculata, basi angustata rotundata, 8–12 cm. longa, coriacea, supra glabra nitida, venulis subtus tomentosis reticulatis, venis utrinque 6–8. *Paniculae* rami ad 30 cm. longi. *Flores* dense nodoso-racemosi nodis brevibus, subsessiles, 1·2–1·3 cm. longi, bracteolis parvis ovatis. *Calyx* anguste campanulatus, 4 mm. longus, dense sericeus, lobis 4 late triangularibus. *Vexilli* lamina oblongo-cymbiformis, basi fortiter auriculata, glabra, ceteris petalis paullo brevior. *Ovarium* sericeum, 2-ovulatum.

W. Tropical Africa. West Lagos, *Rowland*.

9. **L. congolensis**, *Dunn*. *Derris congolensis*, Wildem. in Ann. Mus. Congo, ser. 5, i. (1904), 149, t. xxxviii.; *D. brachyptera*, Wildem. l.c. ser. 3, i. (1901), 73, non Baker.

W. Tropical Africa. Congo, *Chr. Smith*, 51, 62. Herb. Mus. Brit.

10. **L. glabrata**, *Dunn*. *Derris glabrata*, Welw. ex Baker l.c. 244; *Pterocarpus glabratus*, O. Kuntze l.c. 203; *Deguelia glabrata*, Taub. l.c. 387; Hiern l.c. 282.

W. Tropical Africa. Angola, *Welwitsch*, 1888.

11. **L. fasciculata**, *Dunn*. *Lonchocarpus fasciculatus*, Benth. l.c. 100; *Derris fasciculata*, Baker l.c. 246.

W. Tropical Africa. Senegambia, *Heudelot*, 693; *Chevalier*, 3424. Siera Leone, *Morson*, *Scott Elliot*, 5934, *Smythe*, 24. Kamerun: Bipinde, *Zenker*, 3629.

12. **L. nyanzae**, *Dunn*; affinis *L. calvae*, Dunn, sed foliolis minoribus basi rotundatis distincta.

Frutex scandens, gummi rubrum exudans; ramorum adultorum cortice scabro. *Folia* 15–20 cm. longa, 3-juga, petiolulis exceptis glaberrima; foliola oblongo-obovata, apice rotundata-truncata, basi rotundata, 5–6 cm. longa, chartacea, venis 7–8-paribus; petiolulis pubescentibus 3–4 mm. longis, stipellis 0. *Panicula* terminalis. *Flores* in ramis dense nodoso-racemosi nodis brevibus, subsessiles, bracteolis duobus minutis suffulti. *Calyx* anguste campanulatus dentibus 4 brevibus late triangularibus, 3–4 mm. longus, dense sericeus. *Vexillum* anguste oblongum, cymbiforme, exauriculatum, 8 mm. longum, glabrum. *Ovarium* sericeum, 2-ovulatum. *Legumen* planum, oblongum, acuminatum, basi obtusum, 8–12 cm. longum, 2–3 cm. latum, margine superiore alato ala 4 mm. lata, membranaceum, tenuiter adpresse rubro-sericeum, venis tenuiter reticulatis. *Semina* 1–2.

Derris nyanzae, Dunn MS.

Central Africa. Victoria Nyanza: Buruma Island, *Bagshawe*, 605. Herb. Mus. Brit.

13. **L. calva**, *Dunn*; affinis *L. macrothyrsus*, Dunn, sed foliolis exstipellatis, floribus tertia parte brevioribus minime bracteolatis distans.

Frutex scandens; ramis foliisque mox glabris. *Folia* 3–4-juga, 30–40 cm. longa; foliola oblongo-ovata, apice rotundata, apiculata, basi acuta, ad 15 cm. longa vix matura, membranacea, glabra, venis utrinque 7–8; petiolulis 5 mm., stipellis 0. *Paniculae* ex parte inferiore rami, paucae longae, brevissime fusco-tomentosae. *Flores* lutei, dense nodoso-racemosi, nodis ad 6 mm. longis, pedicellis 1–2 mm. longis, bracteolis 1 mm. longis ovatis. *Calyx* anguste campanulatus, 2–3 mm. longus, adpresse tomentosus, lobis 4 brevibus triangularibus. *Vexilli* lamina anguste oblonga, exauriculata, cum ungue 7–8 mm. longa. *Ovarium* rubro-sericeum, 2-ovulatum, stylo glabro.

Derris calva, Dunn MS.

E. Tropical Africa. Uganda: Entebbe, about 1200 m., *E. Brown*, 358.

14. **L. macrothyrsa**, *Dunn*; *Lonchocarpus macrothyrsus*, Harms in Engl. Jahrb. xxvi. (1899), 300; *Derris macrothyrsa*, Dunn MS.

W. Tropical Africa. Kamerun: Yaúnde forest region, *Zenker and Staudt*, 573.

LVII.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

V. *New Chinese Species.*

Acer griseum, *Pax* [Sapindaceae].

A rather bewildering number of new maples have been found in recent years in North-East Asia, but *A. griseum* is one of the most distinct. It is one of the Acers with trifoliolate leaves—a not very numerous group represented in gardens for a good many years by *A. nikoense*. *A. griseum* is a tree 20 to 40 feet high with woolly young branchlets and a trunk furnished with peeling bark which hangs in large, loose flakes. Mr. Wilson found it in Central China and introduced it for Messrs. Veitch in 1901; a young tree has been kindly presented by them to Kew. The collector says it is the most striking of the trifoliolate maples, because of the fine autumnal red and orange colouring of its leaves, and because of the peeling bark just alluded to. The leaflets are 2 to $2\frac{1}{2}$ inches long, oval-lanceolate, coarsely toothed, the terminal one short-stalked, the lateral ones smaller, sessile and oblique. Fruit with very pubescent nutlets and wings, each of the keys $1\frac{1}{4}$ inch long, $\frac{1}{2}$ inch wide, the pair forming an angle of 60° to 90°.

Berberis parvifolia, *Sprague* [Berberidaceae].

Among recent additions to cultivated barberries two species from China stand out as very distinct. The one is *B. Wilsonae*, Hemsl.

(see *K.B.*, 1906, p. 151), now becoming well-known in gardens; the other, a close ally, is *B. parvifolia*, described in *K.B.*, 1908, p. 445, from a specimen collected by Mr. Wilson in Western China. The species, however, has been in cultivation at Kew since 1896, in which year unnamed seeds were obtained from St. Petersburg Botanic Garden. It has recently again been raised from seeds of Mr. Wilson's collecting for Harvard University. It is a low, compact, evergreen shrub; leaves glaucous, oblanceolate or narrowly obovate, ½ to 1 inch long, usually entire but occasionally spiny-toothed, produced in the axils of slender three-parted spines ½ to ⅝ inch long; under surface prominently net-veined, apex terminated by a short spine. Flowers pale yellow, borne in axillary clusters of four to six; pedicels ¼ inch long. Fruit globose, of a pale translucent terra-cotta colour. From *B. Wilsonae* it differs in the more glaucous leaves, in the fasciculate inflorescence (in *B. Wilsonae* it is corymbose), and in the colour and shape of the fruit.

Buddleia nivea, *Duthie* [Loganiaceae].

For the discovery and introduction of this distinct species we are indebted to Mr. E. H. Wilson, who, about 1903, found it on mountain slopes in Western Szechuan at altitudes of 7000–8000 feet, and sent home seeds to Messrs. Veitch. It has since flowered in their nursery at Coombe Wood. Wilson collected a further supply during the later expedition on behalf of Harvard University, and by means of seeds presented by that institution to Kew it has been added to our collection. The most distinguishing mark of the plant is the thick woolly covering of the shoot and under surface of the leaf. When the parts are young this tomentum is pure white and very striking. The flowers are purple and produced during August in a cluster of three terminal cylindrical panicles 6 to 8 inches long and 1 to 1½ inches wide, supplemented by smaller ones from slender axillary branches. The upper portion of strong shoots, therefore, becomes a huge branching inflorescence 1½ to 2 feet long. The purple corolla, however, is nearly hidden by the white, woolly calyx. Like the other hardy species of Buddleia this is a shrub of rapid growth. In two years from seed our plants are 6 feet high. The leaves are ovate-lanceolate, 4 to 10 inches long, 1½ to 4 inches wide, serrate.

Clematis nutans, *Royle* [Ranunculaceae].

I first saw this species in the nursery of Messrs. Simon-Louis at Plantières, near Metz, a few years ago growing under the name of *C. Buchaniana*. It was obtained for the Kew collection and for several years past has flowered very prettily. It is a vigorous climber, with angular pubescent stems, and pinnate leaves composed usually of seven or nine leaflets. The leaflets are 3-lobed, coarsely toothed, pale green and pubescent, especially beneath, 1½ to 3 inches long, scarcely as wide. Flowers primrose-yellow, and with a charming fragrance like that of cowslips. They are borne on erect panicles 5 to 9 inches long, the four sepals forming a cernuous campanulate perianth, with the apices recurved. The species flowers continuously from August to October, and the soft beauty of its blossom combined with the sweet odour make it one of the most attractive of hardy plants in autumn. *C. Buchaniana*, D.C.,

with which it is confused, has much thicker leaves and sepals. The stamens, too, differ in being glabrous and attenuated towards the top, those of *C. nutans* being hairy over their whole length.

C. nutans was introduced to France by means of seed sent from the region of Tatien-lu in Szechuan, China. More recently seeds have been collected by Wilson in the same region.

Osmanthus Delavayi, *Franchet* [Oleaceae].

In 1890 some seeds of this shrub were sent from Yunnan by the Abbé Delavay to Mr. Maurice de Vilmorin, who distributed them to various correspondents. But we are told by Mr. de Vilmorin that of all the seeds thus obtained, only one germinated, and this was in the Paris School of Arboriculture at St. Mandé. From the plant so raised a stock was ultimately obtained, and the species has lately been secured from France for the Kew Arboretum. It is an evergreen shrub of low growth with spreading pubescent branches, thickly furnished with small, stiff, leathery leaves of a dark, shining green, ovate or oval, serrate, ½ to 1 inch long. Flowers pure white and charmingly fragrant, produced in terminal clusters. Corolla with a funnel-shaped tube ½ inch long. Fruit roundish-ovoid, blue-black. Mr. de Vilmorin suggests that it will be well adapted for the Rock Garden. It is very distinct from the Osmanthuses of the Aquifolium group in the terminal (instead of axillary) flowers, opening in spring, and in the long-tubed corolla. It promises to be perfectly hardy.

Pistacia chinensis, *Bunge* [Anacardiaceae].

Among some seeds obtained in 1897 from a private collector in Central China were a few unnamed ones from which were raised two young trees. These remained without a name until recognised one day by Mr. E. H. Wilson as *Pistacia chinensis*. Mr. Wilson, in his earlier journeys, had never been able to get good seed of this tree, but had apparently done so during his last one on behalf of Harvard University, as I saw young specimens at the Arnold Arboretum last summer. The Chinese Pistacia is a deciduous tree up to 80 feet in height. Leaves pinnate, with usually 10 or 12 leaflets, occasionally with an odd one. Leaflets ovate-lanceolate, acuminate, 2½ to 3½ inches long, ¾ inch wide, smooth, unequally divided by the midrib. According to Wilson the foliage of Chinese trees changes to a gorgeous crimson before falling and thus a large tree makes a most beautiful picture. The young shoots and leaves are boiled and eaten as a vegetable by the Chinese. Flowers have not been borne by our young trees, which are about 8 feet high, but they appear to have little beauty, being produced in a cluster of panicles near the end of the branch, the male flowers crowded on racemes about 3 inches long, the female ones on laxer ones 7 to 9 inches long. Fruit the size of peppercorns, first red then blue. This species promises to be quite hardy and a good grower. For gardens generally it will prove the most satisfactory of an interesting genus containing the Pistachio, Mastic and Chian Turpentine trees, none of which thrive really well except in the south-western counties of the British Isles.

By the kind permission of Professor Sargent, Arnold Arboretum, Harvard University, the photograph of this tree, taken by Mr. E.

H. Wilson in China, is reproduced on the accompanying plate. The illustration shows the young shoots in the condition in which they are eaten by the Chinese.

Sarcococca ruscifolia, *Stapf* [Euphorbiaceae-Buxeae] ; species nova a *S. pruniformi*, Lindl., quacum confusa foliis ovatis acutissimis diametro maximo longitudinis dimidium aequante vel paulo superante distincta.

Frutex humilis ; ramulis novellis tenuiter pubescentibus viridibus. *Folia* ovata, basi rotundata, a medio in apicem acutissimum saepe subpungentem sensim attenuata, 3–5 cm. longa, 1·5–2·5 cm. lata, glabra, superne saturate viridia, subcoriacea ; petiolus 3–5 mm. longus, canaliculatus. *Florum* glomeruli circiter 4- (rarius pluri-) flori, ante anthesin nutantes ; bracteae ovatae, acutae. *Perianthii* ♂ sepala 4, late ovato-elliptica, obtusiuscula, minute ciliolata, 3 mm. longa. *Stamina* 4 vel 5, filamentis ad 6 mm. longis, antheris minute apiculatis. *Perianthii* ♀ sepala 6, ovata, angustiora quam in ♂, acuta, minute ciliolata, 2 mm. longa vel paululo longiora ; stigmata 3. *Fructus* subglobosus, 7–8 mm. diametro.

China. Hupeh : Nanto and mountains to northward, *Henry*, 2588, 2589, 2993, 3077, 3287, 3832.

Mr. A. Henry appears to have been the first to discover this interesting and pretty shrub in the neighbourhood of Ichang, Central China, about 1887. It was introduced to cultivation by Mr. Wilson from the same neighbourhood in 1901 for Messrs. Veitch, and has since been grown in the Coombe Wood nursery whence it has been obtained for the Kew collection. It is an evergreen of neat habit, 1 to 2 feet high, renewing itself by new shoots springing direct from the ground after the manner of Butcher's broom. The stems when young are covered with a minute pubescence. Leaves alternate, entire, ovate or oval, acuminate, 1½ to 2½ inches long, ½ to 1¼ inches wide, of a very dark burnished green and perfectly glabrous ; petiole about ⅛ inch long. Flowers milky-white, very fragrant, produced from October to February in small axillary clusters.

The plant will thrive in shady situations or under trees. Easily increased by cuttings.

VI. *American Shrubs and Trees.*

Fothergilla major, *Lodd.* [Hamamelidaceae] (*F. alnifolia* var. *major*, Bot. Mag. t. 1342).

Although to the present generation of arboriculturists this shrub is perfectly new, it is anything but new to English gardens, for it was cultivated as long ago as 1780. For the greater part of the nineteenth century it was lost to gardens, but thanks to the Arnold Arboretum, it was re-introduced to cultivation from the Alleghany Mountains and was sent to Kew by Professor Sargent in 1902. It can be propagated fairly easily by cuttings and a stock has now been obtained. The illustration gives a very good idea of this Fothergilla in blossom. The plant from which it was made is growing in the Arnold Arboretum and is about 8 feet high. The flowers are produced in May on erect cylindrical spikes 1 to 2

PISTACIA CHINENSIS.

[*To face page* 394.

FOTHERGILLA MAJOR.

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inches long. They have no petals and the inflorescence owes its beauty to the numerous clustered stamens, the filaments of which are pinkish-white, ¾ inch long, and the anthers yellow. Leaves roundish-oval, 2 to 4 inches long, stellately hairy beneath.

Like most of the Hamamelidaceae this Fothergilla possesses distinction and an unusual order of beauty, and it seems remarkable that so striking a plant should have been allowed to disappear from gardens for so long. When young the plant is benefited by having a little peat placed about its roots.

Pterocarya Rehderiana, *C. K. Schneider* [Juglandaceae].

One of the most interesting trees noted during my visit to the Arnold Arboretum, Mass., last summer, was a group of this hybrid Pterocarya. The trees are about 40 feet high and produce suckers freely from the roots. So strong is this sucker-producing habit that, given sufficient space, a single tree would apparently form a little grove of itself. Professor Sargent, who recently presented young plants to Kew, says that it thrives better and is hardier in the Arnold Arboretum, than either of its supposed parents—*P. caucasica* and *P. stenoptera*. This hybrid was raised in the Arnold Arboretum from seeds received in 1879 from the late Mr. A. Lavallée's collection at Segrez where trees of both the parent species are still (or were a few years ago) growing in close proximity. *P. caucasica* is well known in the British Isles and several fine examples exist, notably at Claremont in Surrey and Melbury in Dorset. The hybrid differs from it in having narrow wings to the leaf rachis, but these wings are not so much developed as in *P. stenoptera*. In most other respects it is intermediate between the two. It promises to be an ornamental and effective addition to our pinnate-leaved trees and, like many hybrids, possesses apparently a vigour superior to that of its parents.

VII. *A New Heath.*

Erica arborea var. **alpina**, [Ericaceae].

Although a somewhat tender species and occasionally destroyed by frost the typical *Erica arborea* is well known in gardens. According to Aiton it was introduced from the South of Europe in 1658. In 1899, the var. *alpina* was acquired for the Kew collection, and this, so far as I can ascertain, was its first introduction to cultivation. Compared with the ordinary *E. arborea*, it is a sturdier bush with stiffer, more erect branches, and altogether more compact. The young shoots are covered (like the type) with an abundance of branched hairs which, under the lens, give them quite a mossy appearance. The flowers are tiny, but very numerous, of a rather dull white, and produced in spring in stiff, pyramidal panicles 1 foot or more long. The great charm of this variety, however, is the cheerful vivid green of its plume-like branches all through the winter. No frost since 1899 has affected it in the least. During the exceptionally trying winter of 1908–9 not even the smallest twig was injured. It is now 6 or 7 feet high in the Kew Arboretum, where several broad masses are to be seen. Of course a frost more severe than any experienced during the last decade may ultimately injure or kill it, but so far as one can judge at

present, it is one of the best evergreens for winter effect introduced for some time. It is a native of the mountains of Cuenca in Spain, at about 4500 feet altitude.

Explanation of Plates.

Pistacia chinensis, tree 80 feet × 12 feet, male ; near the city of Wan Hsien, Yangtsze River.

Fothergilla major, plant about 8 feet high growing in the Arnold Arboretum.

LVIII.—MISCELLANEOUS NOTES.

His Majesty the King has been graciously pleased to confide to Kew, for exhibition on loan, the model of the **Taitokuin Shrine** presented to His Majesty at the close of the Japan-British Exhibition.

The model has been placed in Museum No. III. It consists of two buildings united by a covered way standing in a courtyard surrounded by a fence. A gateway in this fence gives admission to the courtyard and the buildings are entered by a flight of steps beneath an elaborate portico. The model is on a large table, the whole measuring 22 feet 6 inches in breadth, and rises to a height of 8 feet.

Some details of the original shrine are given in the official account of Tokyo, compiled by the Tokyo Municipal Office for the Japan-British Exhibition, from which the following particulars are taken, and Mr. Yamasaki—under whose direction the model has been placed in position at Kew—has also kindly supplied some additional information.

The Taitokuin, which stands at Shiba Park, Tokyo, is the mausoleum of the second Shogun, Tokugawa Hidetada. The shrine or mausoleum along with another shrine at Nikko, dedicated to the first Shogun, Iyeyashu, are considered to be the two most magnificent edifices ever built during the fifteen generations of the Tokugawa Shoguns, covering a period of about 200 years. The shrine at Nikko, in the province of Shimotsuke, is an imposing structure and is much visited by tourists, but the shrine of the second Shogun, the subject of the model, unfortunately escapes the notice of a considerable number.

The architecture of the Tokugawa era (or the Edo era as the historians would call it) is not distinguished so much for its sublimity and grandeur as for its minute and elaborate workmanship. Much attention was paid to Ki-wari-ho, or the cutting of wood, and to Eyo, or the art of painting and decoration. In fact, it may be called the Rococo style of Japanese architecture. By blending the style used for building temples with that used for the erection of shrines, a new kind of edifice came in vogue in this Period which may be called the "Gongen Style." The shrine at Nikko and this mausoleum are the most remarkable specimens of this new style. The buildings were constructed in 1632 by the order of Iyemitsu, the third Shogun. In construction and proportion the buildings bear close resemblance to Buddhist temples. The Front Gate

(called Vermilion Gate on account of its being painted with vermilion) stands at the foremost position. Entering this gate one comes to the Chokugaku-Mon, or the gate bearing a tablet written in it by an Emperor.

Passing through this he finds two well-houses for purifying hands, one located on each side. Then he comes to the Karamon, or Middle Gate. Beyond this gate, he sees the main buildings comprising three edifices of the Haiden, or Hall of Worship, the Ishinoma, or Hall of Stone, *i.e.* the Side Hall, and the Honden, or Main Hall. This group of the buildings which compose the mausoleum is called the House of Spirit. The Main Hall is in every way like the building of Buddhist temples in construction, double rafters being used. A statue representing the second Shogun is placed in the innermost part of the hall incased in a little shrine. The real tomb is situated on a hillock, a little way behind the sacred buildings. It is one mass of beauty and splendour, the best art of both engraving and sculpture being lavished upon it.

The miniature in question represents the House of Spirit consisting of the three halls, enclosed within the Middle Gate reduced to one-tenth of the original size. The best carpenters, sculptors, goldsmiths, and painters were employed in its construction and ornamentation. In measurement and proportion, exactness has been aimed at, and it has been executed with the same painstaking care as if the very mausoleum were to be reconstructed. The minute details have been followed throughout and even the most insignificant parts have not been overlooked, since the internal structure, ceiling, furniture, &c. have been completed with the same minute care as the exterior; it is, therefore, a matter of regret that a perfect view of the interior cannot be obtained.

The work was commenced in the middle of August and completed towards the end of December last year, the average number of workmen employed amounting to 150 per month.

The original gravel was collected and sent from Kishu, a south-western province lying several hundreds of miles from Tokyo. The pebbles used for the model were obtained from Oshima, an island outlying the Bay of Tokyo, on account of their striking similarity to the original.

Ginkgo biloba.—H.M. The King of Italy has graciously presented to Kew a large consignment of ripe seeds of *Ginkgo biloba* from the trees in the Quirinal Gardens.

Botanical Magazine for December.—The plants figured are *Pinus Armandii*, Franch. (t. 8347); *Neoglaziovia concolor*, C. H. Wright (t. 8348); *Corylopsis Veitchiana*, Bean (t. 8349); *Jacobinia suberecta*, André (t. 8350); and *Dendrobium Sanderae*, Rolfe (t. 8351).

The *Pinus* is a native of South-western China and has been introduced into cultivation by Mr. Augustine Henry, who sent

seeds of it to Kew in 1897. Plants raised from these seeds have now reached a height of from 10 to 15 feet. The species has long leaves in tufts of 5 and resembles in general aspect the Bhutan Pine (*P. excelsa*, Wall.), but its cones are very different. *Neoglaziovia* is a small Brazilian genus of *Bromeliaceae* nearly allied to *Dyckia*. *N. concolor* is a new species the leaves of which, like those of the only other species, *N. variegata*, Mez, furnish a strong fibre. Living plants of both species were received from the Imperial Institute in 1903, and from one of these, which flowered for the first time at Kew in 1909, the material for the figure was obtained. It is distinguished from *N. variegata* by its white lepidote leaves. The *Corylopsis* is a new species differing from *C. sinensis*, Hemsl., in having the mature leaves quite glabrous, the stamens distinctly exserted, and red-brown instead of yellow anthers; and from *C. Henryi*, Hemsl., in having more rounded petals and very much shorter calyx-lobes. The figure was prepared from material supplied by a plant which flowered in the Coombe Wood Nursery of Messrs. J. Veitch & Sons, who raised it from seed received from Western Hupeh in 1900. *Jacobinia suberecta*, a Uruguayan species, was first introduced into cultivation in 1899 by Mr. J. Sallier of Neuilly-sur-Seine. The specimen figured was communicated by Col. R. H. Beddome of West Hill, Putney. The plant has broad grey-green leaves and bright scarlet flowers about $1\frac{3}{4}$ inches long. The recently introduced *Dendrobium Sanderae* is most nearly allied to *D. Dearei*, Reichb. f, from which it is distinguished by having larger flowers, marked on the side lobes and base of the lip with purple stripes. The Kew plant from which the drawing was prepared was presented by Messrs F. Sander & Sons of St. Albans, who introduced the species in 1909 from an unrecorded locality in South-eastern Asia.

The volume of the Botanical Magazine completed by this number is dedicated to Harry J. Veitch, Esq., F.L.S., V.M.H.

Yeheb.—A further consignment of Yeheb nuts (*Cordeauxia edulis*, Hemsl.), has been recently received from Somaliland through Dr. Drake Brockman, who has been long associated with the search for Yeheb. The seeds have been distributed to stations in the dry regions of India and elsewhere in the hope that it may be possible to establish the plant in places where the nuts might form a source of food as they do among the Somalis. The original account of the Yeheb plant was published in the *Kew Bulletin* for 1908, pp. 36–44, and in a later note (*K.B.* 1908, p. 141) a hope was expressed that information as to the subsoil, &c., might be forthcoming. This hope, as regards the soil, has been realised owing to the kindness of Capt. Cordeaux, and Kew is very greatly indebted both to him and to Dr. Drake Brockman for their persistent efforts to obtain seeds and general information about the plant in the face of considerable difficulties.

Capt. Cordeaux in sending two samples of soil informs us that one was taken from the surface round the bush, and another from the roots underground; the surface soil appears to be mainly fine

sand coloured by the very dark red subsoil. He adds "the men who brought in the soil say that the soil in which the roots of the bush are found is *always moist* though the surface is dry."

Dr. Voelcker has kindly examined the soil and from the details given below it will be seen that the successful cultivation of the plant should not depend upon richness of the soil. The poverty of nitrogen in the soil is one of its features, but this defect is probably made good by the fixation of atmospheric nitrogen by the plant.

The detailed results of the analyses of the soils are as follows :—

"SOILS DRIED AT 212° C.

	Surface soil.	Underground.
Organic matter and loss on heating	·15	·62
Oxide of iron	·83	1·34
Alumina	·56	1·89
Lime	·13	·17
Magnesia	·36	·30
Potash	·06	·21
Soda...	·09	·16
Phosphoric acid	·006	·012
Siliceous matters	97·81	95·30
	100·00	100·00
Nitrogen	·011	·026

"The surface soil was of a bright red colour, and appeared to be little more than coarse sand or grit, with total absence of clay. The sub-soil was of a deeper and darker red colour, but, otherwise, much like the top-soil except that it was finer in character and seemed, possibly, to have a little clay with the sand.

"The analyses bring out nothing but the very poor character of the soils ; the surface soil is nearly destitute of vegetable matter and of nitrogen ; it has but very little lime, a mere trace of phosphoric acid, and very little more potash. In no sense could it be called a fertile soil ; on the other hand, it is just a poor sand. The colour of the soil led me to expect the presence of a considerable amount of iron, but this did not prove to be the case, and the soil has practically no clay—as the analysis shows, close on 98 per cent. was siliceous matter.

"The 'underground,' or sub-soil, was richer in elements of fertility than the surface soil, but even it could only be described as a very poor soil, over 95 per cent. consisting of siliceous matter. There is a certain amount of clay in it, but it is very deficient in vegetable matter and in nitrogen. It is also richer than the surface soil in lime, phosphoric acid and potash, though even in this case the amounts are only such as would lead one to consider the soil as agriculturally very poor.

"I cannot think, therefore, from the analyses I have made, that the soils—either of them—possess such elements of fertility as would be specially related to the growth of this particular plant. In other words, I do not think that there is any particular connection between the growth of the Yeheb plant and the constituents which the soils supply, such connection, at least, as would indicate

what the plant specially requires to be supplied to it in the soil. If the Yeheb plant grows well in the soils indicated by the foregoing analyses, it is not because of the richness of the soil; it may possibly be because of its poverty."

At Kew, Yeheb seedlings have been raised in ordinary soil under moist tropical conditions. The plants have been found to be very slow in growth; a few have flowered but no seeds have been ripened.

Begonia Martiana var. grandiflora.—The publication of a figure of this handsome Begonia in the July issue of the Botanical Magazine (t. 8322)—*K.B.*, 1910, p. 201—has elicited from Messrs. V. Lemoine et fils a note as to its origin and history (Gard. Chron., 1910, vol. xlviii., p. 64). A Mexican Begonia was found in the province of Colima by Roezl, who sent it to Mr. Ortgies, Director of the Botanic Garden at Zurich, and it was put into commerce at the commencement of the year 1877 by Messrs. Lemoine, under the name of *B. racemiflora*. This Begonia was crossed by Messrs. Lemoine with *B. diversifolia*, yielding an improved plant, which was sent out in 1882 under the name of *B. racemiflora rosea grandiflora*. In the same year (1882) Messrs. Lemoine put into commerce, under the name of *B. Martiana gracilis*, a plant found by Dr. Parry near San Luis de Potosi, Mexico, and sent to Mr. Max Leichtlin, of Baden-Baden. This *B. Martiana gracilis* was crossed with *B. racemiflora rosea grandiflora* by Messrs. Lemoine, producing a plant which was distributed in 1885 under the name of *B. Martiana grandiflora*, the plant figured in the Botanical Magazine. None of these facts are mentioned by the author of the note and figure in the Illustration Horticole (ser. vi., ii., p. 98, fig. 14), and possibly they were unknown to him. Two other hybrids are mentioned, which are not concerned in the ancestry of the present plant. It now remains to trace the histories of the plants mentioned.

Begonia racemiflora does not appear to have ever been described and there is no reference to it in the Index Kewensis. It is, however, mentioned by Fournier (Journ. Soc. d'Hort. de France, 1879, p. 202) as "*B. racemiflora*, Ortgies, in Lem. Cat. Janv. 1877, no. 75, p. 7," an imperfectly known Mexican species which will not hybridise with the tuberous Begonias. Messrs. Lemoine now speak of it as having flowers of moderate size, white or with rose tint, developed in axillary bunches that show themselves all on the same side of the inflorescence. They also add that the species is lost to cultivation, as well as the first hybrids raised by them from it. The characters mentioned suggest that it may be the plant known in gardens as *B. Martiana* var. *racemiflora*.

The *B. diversifolia* mentioned is probably *B. diversifolia*, Grah. in Edinb. New Phil. Journ. vol. viii. (1829), p. 183; Bot. Mag. t. 2966; which is the *B. gracilis var. diversifolia*, A. DC.

B. Martiana gracilis is figured in colour (Rev. Hort. 1883, p. 372, with plate), and is much like a stout form of *B. Martiana*, Link and Otto, or possibly the nearly allied *B. bulbifera*, Link and Otto, which De Candolle retains as distinct.

It would thus appear that *B. Martiana grandiflora* is not simply a variety, as was inferred from the name, but a plant which has arisen from the intercrossing of three closely allied forms, which might account for its superior vigour and the increased size of the flowers. It is, however, probable that De Candolle would have regarded all three as varieties of a single species.

When the article for the Botanical Magazine was written, the original *B. gracilis*, Kunth, had not been seen and the opinion expressed as to its distinctness was based upon an examination of specimens collected by Pringle near Guadalajara, State of Jalisco (nos. 2456, 11,452), and distributed as *B. gracilis*, H. B. K., which, however, prove different. Kunth's original type was a specimen collected near Pascuaro, Mexico, by Bonpland, which is preserved in the Paris Herbarium, of which a tracing has now been kindly sent, and which agrees substantially with *B. Martiana*, Link and Otto (Ic. Pl. Rar. Hort. Berol., p. 49, t. 25). This leaves the determination of the specimens collected by Pringle uncertain. As formerly pointed out, they have more slender, never strictly erect stems, with more divided leaves, and a different inflorescence. They may be shade-grown specimens of the species, but further materials are necessary, and a careful comparison with all the allied species, some of which are very imperfectly known, before deciding whether they are really distinct.

R. A. R.

Bitter Pit of Apples.—The disease of Apples known as "Bitter Pit," has already received attention at Kew (*K.B.* 1906, p. 193; 1907, pp. 142 and 250). Though known in Europe and America it is in Australia and South Africa that it is most prevalent. In the latter country it is, perhaps, the most serious trouble with which the Apple-grower has to contend.

Two important communications on the subject have recently appeared. Mr. I. B. Pole Evans, Plant Pathologist to the Transvaal Government, publishes the results of his investigations as to the nature and cause of the disease (Transvaal Dept. Agric., Technical Bulletin, no. 1, 1909); and Mr. Charles P. Lounsbury, Entomologist to the Cape Government, gives a full general account, furnishing particulars as to the varieties attacked, and other details useful for practical purposes (Agric. Journ. Cape of Good Hope, xxxvii. 1910, p. 150).

Pole Evans shows that the spots arise in connection with the vascular bundles, and that the starch, which is well known to be present, is part of the original starch and not a secondary product. He believes that the main factors responsible for the spotting are excessive transpiration during the day followed by its sudden checking and complete abeyance during the night, when root action is still vigorous owing to the warmness of the soil. Under these circumstances, water-accumulation in the cells of the fruit takes place to such an extent, that actual bursting of the cells may occur. When this is the case atmospheric oxygen gains access to the cell, and together with the enzymes present, acts on the tannin, producing dark-coloured oxy-compounds, which are precipitated on the walls as a gummy substance, and diastatic action is inhibited.

The neighbouring cells are also affected, and a nest of unhealthy dried cells is the result.

The author concludes that the South African climate is unsuitable for introduced varieties, and urges the necessity of a new stock of home-grown seedlings. The bulletin contains a full bibliography of the literature on Bitter Pit (some 18 papers), and also a short general and historical account.

Lounsbury's contribution brings together for the benefit of the Cape fruit-grower a collection of data that he has obtained from various sources. He is inclined to believe that Bitter Pit is not always brought about by the same cause; but he accepts the explanation given by Pole Evans for its occurrence in South Africa. The paper then treats of questions of storage, stocks, varieties, irrigation, manuring and pruning. An account is also given of the susceptibility of varieties in other continents, being the substance of replies to letters addressed to various fruit experts. This is followed by numerous tables giving the result of South African experience.

In conclusion, it is suggested that fruit-growers should give more attention to varieties which have originated in South Africa. At the same time, owing to their greater number, Apples raised in other continents offer a far larger selection, and the author believes, that among these varieties, some could be found which would be suitable for South African cultivation.

A. D. C.

Forestry in New Zealand.—The Department of Lands, New Zealand, has recently issued its report on "State Nurseries and Plantations" for the year ending March 31st, 1910.

This report is of an interesting character and consists of 38 pages of text and six pages of illustrations. It is prefaced with a review, by the Under-Secretary of Lands, of the work accomplished since the formation of the Forestry Branch of his Department, in 1896, and contains the combined reports of the superintending nurserymen and plantation foremen for the past year.

The Forestry Branch appears to be very well organised, and the report is presented in such a manner that each detail of its work is made perfectly clear to anyone who has a knowledge of forestry.

Since the establishment of forestry operations in 1896, 14,831 acres have been planted and much additional land is in course of preparation. This area is divided into nine plantations which are fed by five nurseries. Two of the nurseries and three of the plantations are situated in the North Island and the remainder in the South Island. A general superintending nurseryman is in charge in each island, and each plantation and nursery is in charge of a plantation foreman.

The reports of the various nurserymen and foremen deal with local peculiarities of land, culture, and climate, a table being appended in each instance showing the average monthly rainfall and maximum and minimum temperatures. Full details are given in every case of the cost of upkeep, whilst lists of the number of each kind of tree to be found in each nursery, with their approximate value, are also given.

Since 1896, 76,757,658 trees, of an estimated value of £140,777, have been raised in the nurseries, whilst 50,545,775 trees have been removed to permanent positions in plantations, shelter belts, and elsewhere.

In each district sufficient labourers are kept for the regular work and extra ones are engaged for planting. In the neighbourhood of prison settlements prisoners are utilised for planting operations and for other work connected with the department. Their general work is reported on very favourably and they are said to take a great interest in the work.

Throughout the report one is struck with the similarity which appears to prevail between conditions in New Zealand and those of the British Isles, whilst the trees which are being planted most extensively there coincide very nearly with those which find most favour here.

Native trees are not planted to any extent. Kauri pine, Podocarpus Totara, has been tried in some districts but has not given satisfactory results. The trees most largely planted are Larix europaea, Pinus Laricio, Pinus ponderosa, Picea excelsa, P. sitchensis, and Pseudotsuga Douglasii, with Eucalyptus resinifera, E. rostrata, E. Stuartiana, and E. amygdalina in the warmer parts of the country. Other trees, such as Sequoia sempervirens, Thuya plicata (T. gigantea), Tsuga canadensis, Larix leptolepis, Fraxinus excelsior, Fagus sylvatica, Alnus glutinosa, Betula alba, Acer Pseudo-platanus, Liquidambar styraciflua, Pinus muricata, P. insignis, &c., are also being planted in some places. The difficulty of obtaining good seeds of some kinds of trees has led to their being planted in limited quantities only, and if good seeds could be imported more easily much larger plantations would be made.

The rate of growth of the different trees appears to be very similar to that which obtains in England. In favoured localities some conifers add five feet to their height in a single year, whilst in others the average is about 1½ feet.

Pure and mixed plantations are discussed, and the general opinion appears to be the same as the one arrived at in England; some trees give better results as a pure crop and others as a mixed crop. Douglas Fir grows too fast to plant as a mixture, whilst Sequoia sempervirens gives the best results as a pure wood in a sheltered valley. Common Larch appears to thrive everywhere and no disease has been observed. Japanese Larch is planted also, but it grows less rapidly than the common kind; the reverse is the case in the British Isles.

A great deal of attention has of necessity to be given to fire belts. These are made from 1 to 1½ chains wide, and are ploughed over annually until the trees interlace so as to exclude sheep from the plantations when they are sown and pastured. The question of rabbit fencing is as important in New Zealand as it is here, and in some districts all young plantations have to be enclosed in wire netting. The average altitude of the plantations appears to be about 1,000 feet; some, however, are but 300 feet above sea-level, whilst others are as much as 1,900 feet. Winter frost does very little harm, but spring and early summer frosts sometimes cut larch and other early growing trees severely.

In the last nine pages of the report Mr. H. A. Goudie, Superintending Nurseryman, deals with the peculiarities of the trees grown in the North Island, and in addition to other interesting information gives an account of the average number of trees which may be expected from 1 lb. of imported seed of 11 different kinds of trees. That account is appended :—

Name of Species.	Average Number of Trees raised from 1 lb. of Seed.	Average Cost of Seed for 1,000 Trees.	Remarks.
		s. *d.*	
Larix europaea	3,500	0 7·87	Imported from Europe.
Pinus austriaca	4,300	0 11·63	,, ,, ,,
,, Laricio	5,500	0 7·33	,, ,, ,,
,, ponderosa	3,200	3 4	,, ,, America.
,, Strobus	2,000	6 1	,, ,, ,,
,, radiata	11,000	0 3·37	Seed saved in New Zealand.
Pseudotsuga Douglasii ...	5,400	2 5½	Imported from America.
Sequoia sempervirens ...	1,200	12 7	,, ,, ,,
Eucalyptus Stuartiana ...	24,500	0 3½	,, ,, Australia.
,, pauciflora ...	14,500	0 5¼	,, ,, ,,
,, amygdalina ...	24,500	0 2½	,, ,, ,,

W. D.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1910.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1909. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena adscendens.
macrostemon.
microphylla.
Novae-Zealandiae.
ovalifolia.

Achillea Ageratum.
grandiflora.
macrophylla.

Aconitum Kusnezoffi.
uncinatum.
vulparia.
Wilsoni.

Actaea spicata.
— var. rubra.

Adenophora denticulata.
Potanini.

Adesmia muricata.

Adlumia cirrhosa.

Adonis aestivalis.
autumnalis.

Aethionema cappadocicum.
saxatile.

Agrimonia odorata.
repens.

Agropyron acutum.
tenerum.
villosum.

Agrostis alba.
elegans.
nebulosa.

(14774—6*a*.) Wt 108—471. 1375. 11/09. D & S.

Aira caryophyllea.

Allium albo-pilosum.
atropurpureum.
ciliare.
giganteum.
karataviense.
margaritaceum.
narcissiflorum.
neapolitanum.
odorum.
Ostrowskianum.
pulchellum.
Schuberti.
Suworowi.
Tubergeni.
zebdanense.

Alonsoa Warscewiczii.

Alstroemeria aurantiaca.
haemantha.

Althaea armeniaca.
ficifolia.
hirsuta.
kurdica.
pallida.
pontica.
rosea.
sulphurea.

Alyssum argenteum.
creticum.
incanum.
podolicum.
saxatile var. citrinum,
spinosum.

Amaranthus caudatus.
Dussii.
hypochondriacus.
polygamus.
retroflexus.
speciosus.

Ambrosia trifida.

Amellus annuus.

Amethystea caerulea.

Ammi Visnaga.

Anacyclus officinarum.

Anchusa capensis.
— var. angustifolia.
italica.

Andryala integrifolia.

Anemone baldensis.
cylindrica.
multifida.
Pulsatilla.
— var. lilacina.
rivularis.
sylvestris.

Angelica dahurica.

Anoda hastata.
Wrightii.

Anthericum Liliago.

Antirrhinum Orontium.

Apera interrupta.
Spica-Venti.

Aplopappus croceus.

Aquilegia alpina.
caerulea.
canadensis.
chrysantha.
flabellata.
glandulosa.
— var. bicolor.
olympica.

Arabis alpina.
arenosa.
serpyllifolia.
verna.

Arctium nemorosum.

Arenaria cephalotes.
graminifolia.
grandiflora.
pinifolia.

Argemone grandiflora.
hispida.
mexicana.
ochroleuca.
platyceras.

Armeria majellensis.
plantaginea.

Arnica Chamissonis.
longifolia.
montana.
sachalinensis.

Asperula azurea.
ciliata.
galioides.

Asphodeline lutea.

Asphodelus albus.

Aster alpinus.
foliaceus.
radula.

Astilbe chinensis.
Davidii.
grandis.
rivularis.

Astragalus alopecuroides.
boeticus.
chinensis.
chlorostachys.
frigidus.
Glyciphyllos.
hamosus.
pentaglottis.
xiphocarpus.

Astrantia Biebersteinii.

Athamanta Matthioli.

Atriplex rosea.
sibirica.

Atropa Belladonna.

Aubrietia Pinardi.
tauricola var. alba.

Baeria coronaria.

Baptisia australis.

Barbarea arcuata.
praecox.
stricta.

Basella rubra.

Beckmannia erucaeformis.

Beta Bourgaei.
trigyna.

Bidens leucantha.
tripartita.

Biscutella auriculata.
ciliata.
laevigata.

Bloomeria Clevelandi.

Blumenbachia insignis.
muralis.

Bocconia microcarpa.

Bongardia Rauwolfii.

Brachycome iberidifolia.

Brachypodium caespitosum.
japonicum.
sylvaticum.

Brassica alba.
campestris.
— var. chinensis.
Cheiranthos.
Erucastrum.
juncea.
nigra.
rugosa.
Tourneforti.

Brevoortia Ida-Maia.

Briza gracilis.
maxima.
minor.

Brodiaea grandiflora.
laxa.
Purdyi.

Bromus adoënsis.
breviaristatus.
carinatus.
ciliatus.
commutatus.
japonicus.
Kalmii.
macrostachys.
madritensis.
marginatus.
maximus.
Porteri.
polyanthus.
Richardsoni.
secalinus.
squarrosus.
Tacna.
Trinii.
unioloides.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum aureum.
Candollei.
glaucum.
longifolium.
ranunculoides.
rotundifolium.
stellatum.
sachalinense.

Calamagrostis confinis.

Calandrinia pilosiuscula.

Calceolaria mexicana.
polyrrhiza.

Callistephus hortensis.

Calochortus albus.
pulchellus.

Calystegia sepium var. dahurica.

Camassia Cusickii.
esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
barbata.
Beauverdiana.
bononiensis.
lactiflora.
latifolia.
latiloba.
longistyla.
primulaefolia.
punctata.
ramosissima.
Scheuchzeri.
spicata.
velutina.

Capsella Heegeri.

Carbenia benedicta.

Carduus cernuus.
tenuiflorus.

Carex arctata.
Buchanani.
crinita.
Grayii.
pendula.

Carpesium cernuum.

Carthamus flavescens.
tinctorius.

Carum copticum.

Celsia orientalis.

Cenia turbinata.

Centaurea atropurpurea.
cynaroides.
Fontanesii.
montana.
pulchra.
rupestris.

Centranthus macrosiphon.
Sibthorpii.

Cephalaria alpina.
syriaca.

Cerastium Biebersteinii.
perfoliatum.
tomentosum.

Chaerophyllum aromaticum.
nodosum.

Charieis heterophylla.

Chelone Lyoni.
obliqua.

Chenopodium Bonus-Henricus.
foetidum.
murale.
urbicum.
virgatum.

Chorispora tenella.

Chrysanthemum coronarium.
cinerariaefolium.
corymbosum.
Myconis.
palmatum.
setabense.
viscosum.

Chrysopogon Gryllus.

Cicer arietinum.
pinnatifidum.

Cimicifuga americana.
cordifolia.
foetida.
racemosa.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Clematis diversifolia.

Cleome violacea.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
syriacus.

Cochlearia danica.
officinalis.
saxatilis.

Codonopsis ovata.

Collinsia bartsiaefolia.
bicolor.
verna.

Collomia coccinea.
gilioides.
grandiflora.

Commelina coelestis.
Hasskarlii.

Conringia orientalis.

Convolvulus farinosus.
libanoticus.
tricolor.
undulatus.

Coreopsis auriculata.
Drummondi.
tinctoria.

Coriandrum sativum.

Cornucopiae cucullatum.

Coronilla elegans.
scorpioides.

Cortusa Matthioli.

Corydalis capnoides.
cheilanthifolia.
racemosa.
rosea.
vesicaria.

Cosmos diversifolius.
parviflorus.

Crepis blattarioides.
rubra.
sibirica.

Crocus alatavicus.
aureus.
etruscus.
hadriaticus.
Imperati.
iridiflorus.
longiflorus.
medius.
nudiflorus.
pulchellus.
reticulatus.

Crucianella aegyptiaca.
latifolia.

Crupina vulgaris.

Crypsis aculeata.

Cuminum Cyminum.

Cuphea Zimapani.

Cuscuta Gronovii.

Cynoglossum cheirifolium.
Wallichii.

Cynosurus echinatus.

Datura inermis.
Tatula.

Delphinium Brunonianum.
consolida.
dyctiocarpum.
elatum.
Geyeri.
grandiflorum.
hybridum.
Maackianum.
occidentale.
Pylzowi.
speciosum.
— var. glabratum.
trolliifolium.

Deschampsia caespitosa.

Desmodium canadense.

Deyeuxia Langsdorfii.

Dianthus arenarius.
caesius.
capitatus.
cruentus.
deltoides.
giganteus.
hirtus.
petraeus.
pungens.
Seguieri.
squarrosus.
superbus.
tener.
Waldsteini.

Digitalis ambigua.

Dimorphotheca aurantiaca.
pluvialis.

Dipcadi serotinum.

Diplotaxis muralis.

Dipsacus asper.
atratus.
Fullonum.
inermis.
laciniatus.
pilosus.
plumosus.

Dischisma spicatum.

Dodartia orientalis.

Dodecatheon Meadia.

Dorycnium herbaceum.
rectum.

Downingia elegans.

Draba alpina.
altaica.
Athoa.
carinthiaca.
cuspidata.
frigida.
grandiflora.
hirta.
incana.
stellata.

Dracocephalum Moldavicum.
peregrinum.
Ruyschiana.
— var. japonicum.

Drypis spinosa.

Dulichium spathaceum.

Ecballium Elaterium.

Echinaria capitata.

Echinocystis lobata.

Echinodorus ranunculoides.

Echium plantagineum.
rubrum.

Eleusine coracana.

Elsholtzia cristata.

Elymus canadensis.
Caput-Medusae.
condensatus.
crinitus.

Encelia calva.

Epilobium Dodonaei.
linnaeoides.

Eragrostis curvula.
pilosa.

Eranthis cilicica.

Erigeron alpinus.
Ellisii.
flagellaris.
glabellus.
grandiflorus.

Erinus alpinus.

Erodium Botrys.
ciconium.
malacoides.
Manescavi.

Eruca sativa.

Eryngium alpinum.
Bourgati.
bromeliaefolium.
ebracteatum.
eburneum.
giganteum.
maritimum.
planum.
spinalba.

Erysimum arkansanum.
Perofskianum.

Erythronium californicum.
giganteum.
Hendersoni.
Johnsoni.
revolutum.

Eschscholzia caespitosa.

Eucharidium concinnum.

Eupatorium ageratoides.

Fedia Cornucopiae.

Felicia fragilis.

Ferula communis var. glauca.
Jaeschkeana.
Narthex.
thyrsiflora.

Festuca bromoides.
Halleri.
Myuros.
Poa.
rigida.
tenella.
uniglumis.

Foeniculum dulce.
Panmorium.
virescens.

Fragaria Daltoniana.

Fritillaria acutiloba
askabadensis.
citrina.
conica.
pallidiflora.
tenella.
Tuntasia.

Gaillardia amblyodon.
aristata.

Galax aphylla.

Galega orientalis.

Galeopsis ochroleuca.
pyrenaica.
Tetrahit.

Galium thymifolium.

Gastridium australe.

Gaudinia fragilis.

Gentiana asclepiadea.
crassicaulis.
Cruciata.
decumbens.
Freyniana.
phlogifolia.
septemfida.
tibetica.

Geranium albiflorum.
Endressi.
grandiflorum.
incisum.
polyanthes.

Gerbera Anandria.
Bellidiastrum.

Geum Heldreichii.

Gilia achilleaefolia.
androsacea.
— var. alba.
capitata.
liniflora.
micrantha.
squarrosa.
tricolor.

Gillenia trifoliata.

Glaucium corniculatum.
flavum.
— var. fulvum.
— var. tricolor.

Glyceria distans.

Glycine Soja.

Gratiola virginiana.

Grindelia glutinosa.
robusta.

Guizotia abyssinica.

Gymnolomia multiflora.

Gypsophila acutifolia.
elegans.
muralis.
viscosa.

Hastingsia alba.

Hebenstretia tenuifolia.

Hedysarum coronarium.
esculentum.
microcalyx.
neglectum.

Helenium Hoopesii.
Thurberi.

Helianthemum ledifolium.
salicifolium.
Tuberaria.

Helianthus Nuttallii.

Helichrysum bracteatum.
foetidum.

Heliophila amplexicaulis.
crithmifolia.
pendula.
pilosa.

Helipterum corymbosum.
Humboldtianum.
Manglesii.
roseum.

Herniaria glabra.
hirsuta.

Hesperis matronalis.

Heterospermum Xanti.

Heuchera Drummondi.
glabra.
pubescens.

Hibiscus Trionum.

Hieracium alpinum.
amplexicaule.
aurantiacum.
Bornmülleri.
Eriophorum.
lanatum.
pannosum.
villosum.

Hilaria rigida.

Hippocrepis multisiliquosa.
unisiliquosa.

Holosteum umbellatum.

Hordeum bulbosum.
crinitum.
jubatum.
maritimum.

Hosackia Purshiana.

Hunnemannia fumariaefolia.

Hyacinthus amethystinus.
azureus.
— var. amphibolus.

Hydrophyllum virginicum.

Hymenophysa pubescens.

Hyoscyamus albus.
aureus.

Hypecoum grandiflorum.
procumbens.

Hypericum chinense.
hirsutum.
polyphyllum.

Hypochaeris glabra.

Iberis Amara.
pinnata.
umbellata.

Impatiens fulva.
Noli-tangerre.

Incarvillea Delavayi.

Inula macrocephala.
racemosa.

Iris bracteata.
bucharica.
Clarkei.
Douglasiana.
graminea.
Hookeri.
longipetala.
missouriensis.
orchioides.
sindjarensis.
tenax.
warleyensis.
Watsoniana.

Isatis glauca.

Isopyrum fumarioides.

Ixiolirion montanum.
— var. tataricum

Juncus alpinus.
Chamissonis.

Jurinea ambigua.

Kochia scoparia.

Koeleria albescens.
phleoides.

Lactuca Bourgaei.
hastata.

Lagascea mollis.

Lagurus ovatus.

Lallemantia peltata.
Royleana.

Laserpitium Siler.

Lathyrus angulatus.
Aphaca.
articulatus.
Cicera.
Clymenum.
filiformis.
luteus.
maritimus.
montanus.
Ochrus.
rotundifolius.
sativus.
setifolius.
tingitanus.
tuberosus.
variegatus.
venosus.

Lavatera cachemiriana
trimestris.

Layia elegans.

Leonurus Cardiaca.
sibiricus.
tataricus.

Lepidium Smithii.

Leptosyne maritima.
Stillmanni.

Leuzia longifolia.

Lepturus cylindricus.

Libertia grandiflora.

Ligusticum pyrenaicum.
scoticum.
Seguieri.

Lilium croceum.
giganteum.
Martagon.

Limnanthes alba.
Douglasii.

Linaria anticaria.
bipartita.
Elatine.
maroccana.
origanifolia.
multipunctata.
reticulata.
saxatilis.
triphylla.
tristis.
viscida.

Lindelofia anchusoides.

Linum angustifolium.
grandiflorum.
nervosum.
usitatissimum.

Loasa hispida.
vulcanica.

Lobelia sessilifolia.
syphilitica.

Lolium multiflorum.
temulentum.

Lopezia coronata.
mexicana.

Lotus ornithopodioides.
Requienii.
siliquosus.
Tetragonolobus.

Lunaria biennis.
rediviva.

Lupinus affinis.
arboreus.
Barkeri.
Cruckshanksii.
Douglasii.
elegans.
Hartwegii.
hirsutissimus.
micranthus.
nootkatensis.
pubescens.
rivularis.

Luzula albida.
nivea.
vernalis.

Lychnis alpina.
coelirosa.
coronaria.
Flos-jovis.
fulgens.
Haageana.
Lagascae.

Lycurus phleoides.

Lysimachia decurrens.
punctata.

Madia dissitiflora.
sativa.

Malcolmia africana.
chia.

Malope trifida.

Malva Alcea.
Duriaei.
oxyloba.
parviflora.

Malvastrum limense.

Matthiola bicornis.
sinuata var. glabra albiflora.

Meconopsis aculeata.
cambrica.
racemosa.
sinuata var. latifolia.

Medicago Echinus.
Helix.
hispida.
littoralis.
orbicularis.
scutellata.
turbinata.

Melica altissima.

Melilotus alba.

Mentzelia Lindleyi.

Mesembryanthemum pyropeum.
pomeridianum.

Mimulus cardinalis.
Lewisii.
luteus.

Mirabilis jalapa.
Wrightiana.

Molinia cœrulea.

Monolepis trifida.

Morina longifolia.

Moscharia pinnatifida.

Muscari armeniacum.
compactum.
paradoxum.
pulchellum.
parviflorum.
Szovitzianum.

Myagrum perfoliatum.

Myosuros minimus.

Myriactis Gmelini.

Nardus stricta.

Nemesia strumosa.
versicolor.

Nemophila insignis.
maculata.
Menziesii.
parviflora.

Nepeta Mussini.
nuda.
Sibthorpii

Nertera depressa.

Nicandra physaloides.

Nicotiana Langsdorffii.
paniculata.
rustica.

Nigella damascena.
Garidella.
orientalis.
sativa.

Noccaea stylosa.

Nolana prostrata.

Ochthodium aegyptiacum.

Œnanthe pimpinelloides.
silaifolia.

Œnothera decumbens.
pumila.
Romanzowi.
tenella.
tenuifolia.
tetraptera.

Omphalodes linifolia.

Ononis alopecuroides.
Natrix.
rotundifolia.

Onopordon Acanthium.
acaulon.

Ornithopus sativus.

Oryzopsis miliacea.

Oxytropis lapponica.
ochroleuca.

Paeonia Bakeri.
decora var. alba.
— var. Pallasii.
microcarpa.
Veitchii.

Panicum bulbosum.
capillare.
proliferum.
Teneriffae.

Papaver alpinum.
apulum.
Argemone.
commutatum.
glaucum.
orientale.
pavoninum.
rupifragum.
somniferum.

Parnassia palustris.

Parrya Menziesii.

Pelargonium australe.

Pennisetum longistylum.
macrourum.

Pentstemon barbatus.
campanulatus.
confertus.
gentianoides.
glaber.
gracilis.
laevigatus.
linarioides.
pubescens.
secundiflorus.
virgatus.

Phacelia congesta.
malvaefolia.
viscida.
Whitlavia.

Phalaris brachystachys.
minor.
paradoxa.

Phleum arenarium.
asperum.

Physalis Alkekengi.
Bunyardi.
Francheti.

Phuopsis stylosa.

Physochlaina orientalis.

Physostegia virginiana.

Phyteuma canescens.
Michelii.
nigrum.
orbiculare.
Scheuchzeri.
spicatum.

Phytolacca acinosa.
bogotensis.

Plantago Candollei.
Coronopus.
Lagopus.
maritima.
ovata.
Psyllium.
tibetica.

Platycodon grandiflorum.
— var. Mariesii.

Plumbago micrantha.

Poa abyssinica.
violacea.

Podolepis gracilis.

Podophyllum Emodi.

Polemonium mexicanum.
pauciflorum.

Polygonum alpinum.
molle.
Posumbo.
viviparum.
Weyrichii.

Polygonatum biflorum.
latifolium.
verticillatum.

Polypogon littoralis.
monspeliensis.

Portulaca grandiflora.

Potentilla argyrophylla.
crinita.
Detommasii.
fulgens.
gelida.
glandulosa.
gracilis.
Herbichii.
hirta.
leuconota.
mollis.
montenegrina.
nepalensis.
recta.
rivale.
sericea.
tanacetifolia.
tridentata.
villosa.

Poterium alpinum.
canadense.

Pratia angulata.
begonifolia.

Prenanthes altissima.

Primula capitata.
denticulata
— var. alba.
frondosa.
japonica.
luteola.
rosea.
verticillata.

Psoralea macrostachya.

Ramondia pyrenaica.
— var. alba.

Ranunculus amplexicaule.
asiaticus.
brutius.
Chius.

Reseda glauca.
virgata.

Rhagadiolus edulis.

Rheum Rhaponticum.
Webbianum.

Rodgersia aesculifolia.
pinnata.

Roemeria hybrida.

Romulea candida.
cruciata.
nivalis.
ramiflora.
speciosa.

Rudbeckia ampla.
amplexicaulis.
hirta.

Rumex alpinus.
limosus.
palustris.
salicifolius.

Salsola Kali.

Salvia Aethiopis.
Beckeri.
coccinea.
Columbariae.
dichroa.
glutinosa.
Horminum.
Schiedeana.
Sclarea.
taraxacifolia.
tiliaefolia.
turkestanica.
verticillata.
virgata.
viridis.

Sambucus Ebulus.
— var. latifolius.

Sanicula europaea.

Sanvitalia procumbens.

Saponaria Vaccaria.

Saussurea albescens.

Saxifraga cartilaginea.
cochlearis.
— var. minor.
Cotyledon.
Fortunei.
Hostii.
lingulata.
— var. lantoscana.
Macnabiana.
madida.
media.

Saxifraga--*cont.*
mutata.
peltata.
rocheliana.
rotundifolia.
Sibthorpii.
sponhemica.
tenella.

Scabiosa australis.
brachiata.
dalmatica.
gramuntia.
isetensis.
leucophylla.
longifolia.
prolifera.
pyrenaica.
speciosa.
vestina.

Schizanthus pinnatus.
retusus.

Scilla hispanica.
patula.
verna.

Scolymus hispanicus.
maculatus.

Scopolia lurida.

Scorpiurus vermiculata.

Scrophularia alata.
laciniata.
Scorodonia.

Scutellaria altissima.
indica var. japonica.

Secale cereale.
dalmaticum.

Sedum altissimum.
maximum.
oppositifolium.

Selinum serbicum.
vaginatum.

Senecio Clivorum.
Doria.
Doronicum.
elegans.
lanatus.
Ledebouri.
sibiricus.
Veitchii

Serratula coronata.

Seseli globiferum.
Hippomarathrum.
Libanotis.
Tommasinii.
tortuosum.

Setaria glauca.
italica.
vulpiseta.

Sidalcea candida.
malvaeflora.
neo-mexicana.
spicata.

Siegesbeckia orientalis.

Silene alpestris.
Armeria.
asterias.
ciliata.
clandestina.
colorata.
conoidea.
cretica.
fimbriata.
fuscata.
glauca.
juvenalis.
laeta.
linicola.
longicilia.
melandrioides.
Muscipula.
noctiflora.
paradoxa.
pendula.
quadrifida.
rubella.
sedoides.
Sendtneri.
squamigera.
stylosa.
tatarica.
tenuis.
Zawadskii.

Silphium trifoliatum.

Silybum eburneum.
Marianum.

Sisymbrium polyceratum.
strictissimum.
Sophia.

Sisyrinchium angustifolium.
chilense.
iridifolium.
striatum.

Specularia falcata.
pentagonia.
Speculum.

Sporobolus cryptandrus.

Stachys Alopecuros.
graeca.
grandiflora.

Statice speciosa.

Stevia Eupatoria.
ovata.

Stipa Calamagrostis.
capillata.
elegans.
gigantea.
Lessingiana.
papposa.
pennata.
viridula.

Swertia perennis.

Symphyandra Hofmanni.
Wanneri.

Symphytum asperrimum.

Synthyris reniformis.

Teesdalia regularis.

Tellima grandiflora.

Tetragonia crystallina.
expansa.

Thalictrum angustifolium.
aquilegifolium.
calabricum.
odoratum.
purpurascens.
squarrosum.

Thermopsis fabacea.
montana.

Thlaspi perfoliatum.

Tigridia Pavonia.

Tricyrtis latifolia

Tridax trilobata.

Trifolium agrarium.
Alexandrinum.
alpestre.
Johnstoni.
leucanthum.
Perreymondi.
resupinatum.
rubens.
scabrum.

Trigonella corniculata.
caerulea.
cretica.
Foenum-graecum.
ovalis.
polycerata.
radiata.

Trillium grandiflorum.

Trisetum distichophyllum.
flavescens.

Triticum Aegilops.
amyleum.
dicoccum.
monococcum.
polonicum.
speltoides.

Trollius sinensis.

Tulipa Batalini.
Fosteriana.
praestans.
— var. Tubergeniana.

Tunica Saxifraga.

Tyrimnus leucographis.

Urospermum picroides.

Urtica pilulifera.
— var. balearica.

Valeriana sambucifolia.

Vaillantia hispida.

Valerianella Auricula.
coronata.
dentata.
Dioscoridis.
echinata.
eriocarpa.
vesicaria.

Veratrum nigrum.

Verbascum Blattaria.
— var. album.
longifolium.
phoeniceum.

Verbena bonariensis.
erinoides.

Verbesina encelioides.

Veronica incana.
longifolia.
orchidea.
saxatilis.
spicata.
virginica.
— var. japonica.

Vesicaria reticulata.

Vicia atropurpurea.
bithynica.
calcarata.
gigantea.
grandiflora.
narbonensis.
pisiformis.
sylvatica.

Vincetoxicum fuscatum.
nigrum.

Viola arenaria.
cornuta.
palustris.
persicifolia.
sylvestris.

Xanthium macrocarpum.

Zaluzianskya capensis.

Zygadenus bracteatus.
elegans.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

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*Abies brachyphylla.
*Veitchii.

Acanthopanax sessiliflorum.
spinosum.

Acer circinatum.
glabrum.
Heldreichii.
insigne.
tataricum.
Trautvetteri.

Ailanthus glandulosa.

Alnus barbata.
cordifolia.
firma.
incana.
japonica.
orientalis.
nitida.
viridis.

Aralia chinensis.

Berberis
aetnensis.
angulosa.
aristata.
concinna.
dictyophylla.
pachyacantha.
parvifolia.
Thunbergi.
umbellata.
virescens.
Wilsonae.

Betula Ermani.
papyrifera.
populifolia.

Buddleia albiflora.
japonica.
variabilis.
— var. Veitchianus.
*sp. China.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
*brevispina.
frutescens.
microphylla.

Carmichaelia australis.

Celastrus articulatus.

Celtis glabrata.
occidentalis.

Cephalotaxus drupacea.
Fortuni.

Cistus laurifolius.

Cladrastis amurensis.

Clematis aromatica.
Bergeroni.
connata.
globosa.
heraclaefolia.
intermedia.
montana.
— var. rubens.
Pitcherii.
songarica.
viticella.

Clethra acuminata.
canescens.

Colutea arborescens.
aurantiaca.
cruenta.

Cornus alba.
candidissima.
circinata.
macrophylla.

Coronilla emeroides.

Cotoneaster affinis.
arborescens.
bacillaris.
bullata.
buxifolia.

Cotoneaster—*cont.*
Franchetii.
horizontalis.
microphylla.
Nummularia.
pannosa.
rotundifolia.
Simonsii.
thymifolia.

Crataegus altaica.
atrorubens.
Carrièrei.
coccinea.
Crus-Galli.
Dippeliana.
durobrivensis.
elliptica.
Heldreichii.
melanocarpa.
mexicana.
mollis.
nigra.
orientalis.
pentagyna.
punctata.
sorbifolia.
tanacetifolia.
tomentosa.

Cupressus thyoides.

Cydonia Maulei.

Cytisus albus.
biflorus.
capitatus.
Heuffeli.
nigricans.
purgans.
sessilifolius.

Daboëcia polifolia.

*Dammara australis.

Decaisnea Fargesii.

Deutzia corymbosa.
crenata.

Diervilla florida.

Dorycnium hirsutum.

Elaeagnus umbellata.

Eleutherococcus Henryi.

Erica multiflora.
stricta.

Euonymus latifolius.
oxyphyllus.
planipes.

Exochorda Alberti.

Fraxinus Ornus.
parvifolia.

Gaultheria procumbens.
Shallon.

Genista aethnensis.
dalmatica.
germanica.
hispanica.
pilosa.
radiata.
virgata.

Helianthemum formosum.
polifolium.

Hippophaë rhamnoides.

Hydrangea arborescens.
aspera.
Bretschneideri.
paniculata.
petiolaris.
vestita.

Hymenanthera crassifolia.

Hypericum Androsaemum.
aureum.
elatum.
hircinum.
Hookerianum.
inodorum.
patulum.
— var. Henryi.

Ilex opaca.
verticillata.

Indigofera Gerardiana.

Jamesia americana.

Jasminum humile.

Laburnum alpinum.
Vossii.

Larix leptolepis.

Ledum palustre.

Leiophyllum buxifolium.

Lespedeza bicolor.

Lonicera dioica.
orientalis.
Xylosteum.

Lupinus arboreus.

Lyonia ligustrina.

Neillia amurensis.
capitata.
opulifolia.

Olearia Haastii.

Ononis arragonensis.
fruticosa.
rotundifolia.

Paliurus australis.

Pernettya mucronata.

Petteria ramentacea.

Philadelphus Gordonianus.
grandiflorus.
insignis.
Lewisii.

Picea nigra.

Pieris floribunda.
japonica.

Prunus humilis.
maritima.

Ptelea trifoliata.

Pyrus alpina.
americana.
arbutifolia.
Aria var. graeca.
auricularis.
Balansae.
canescens.
elaeagrifolia.
lanuginosa.
longipes.
Michauxii.
Neidzwetzkyana.
nigra.
nivalis.
prunifolia.
Ringo.
rotundifolia.
Schiedeckeri.
sikkimensis.
sinaica.
spectabilis.
spuria.
Toringo.
Tschonoskii.

Rhamnus caroliniana.
cathartica.
crenata.
davurica.
rupestris.
verniciflua.

Rhodotypus kerrioides.

Rhus aromatica.

Ribes alpinum.
mogollonicum.

Rosa sericea var. pteracantha.

Rubus conduplicatus.
Millspaughii.
nutkanus.
occidentalis.
phoenicolasius.
villosus.
xanthocarpus.

Ruta graveolens.

Securinega fluggeoides.

Skimmia japonica.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
betulifolia.
expansa.

Staphylea colchica.
Coulombieri.
pinnata.
trifolia.

Styrax japonica.

Symphoricarpus racemosus.

Syringa Emodi.

Taxus cuspidata.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1910.

NOTE.

In the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1909, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

(16154—6*a*.) Wt. 92—428. 1375. 5/10. D & S.

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§ 4.—MANUSCRIPTS.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1910.

NEW GARDEN PLANTS OF THE YEAR 1909.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1909. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1909, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows :—*B. K.*—Guerke, Blühende Kakteen. *B. M.*—Botanical Magazine. *B. S. B. F.*—Bulletin de la Société Botanique de France. *B. S. D. F.*—Bulletin de la Société Dendrologique de France. *B. T. O.*—Bullettino della

(16416—6a.) Wt 92—428. 1375. 5/10. D & S.

R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Hesse Cat.*—H. A. Hesse, General Nursery Catalogue. *I. S. H. T.*—Icones Selectae Horti Thenensis. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. R. H. S.*—Journal of the Royal Horticultural Society. *J. S. H. F.*—Journal de la Société Nationale d'Horticulture de France. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *Lemoine Cat.*—Lemoine, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. K.*—Monatsschrift für Kakteenkunde. *N. B. G. Edinb.*—Notes from the Royal Botanic Garden, Edinburgh. *O. R.*—Orchid Review. *Orch.*—Orchis. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sargent, T. & S.*—Sargent, Trees and Shrubs. *S. C. A. A. Cat.*—Southern California Acclimatizing Association Catalogue. *S. M. C.*—Smithsonian Miscellaneous Collections. *Späth Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch Herb. P. Nov.*—J. Veitch & Sons, New and rare Herbaceous Plants, Novelties. *Veitch, N. H. P.*—J. Veitch & Sons, New Hardy Plants from Western China.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies subalpina pendula. (*M. D. G.* 1909, 268, 326.) Coniferae. H. Branches pendulous. (Prince M. Lobkowitz, Eisenberg, Bohemia.)

***Abies Vilmorini.** (*Hesse Cat.* 1909–10, 246.) H. A hybrid between *A. Pinsapo* and *A. cephalonica*. (H. A. Hesse, Weener, Hanover.)

Abutilon longicuspe. (*S. C. A. A. Cat.* 1908, 20.) Malvaceae. G. A much-branched shrub, thickly covered with fine down. Leaves petiolate, broadly ovate, long-acuminate, cordate at the base, serrate. Flowers bluish-purple. See *Oliver, Fl. Trop. Afr.* i. 184. Abyssinia. (Southern California Acclimatizing Association.)

***Abutilon sinense.** (*R. H.* 1909, 171, 450, f. 190 & col. t.; *J. S. H. F.* 1909, p. 185.) G. Leaves very large, broadly ovate, acuminate, cordate at the base, irregularly toothed. Flowers numerous, campanulate, more than 2 in. across, orange-yellow, with broad blotches of brown-red in the centre and veined with the same colour. Central China. (M. L. de Vilmorin, Les Barres, France.)

Acalypha. (*R. H.* 1909, 20–22.) Euphorbiaceae. S. The following hybrids between *A. Sanderiana* and *A. Godseffiana* are described: *Beissneriana, Camphauseniana, Hesdoerfferiana, Johniana, Sandhackiana* and *Wagneriana.* (H. A. Sandhack, Mehlem-on-Rhein, Germany.)

Acanthopanax acerifolium. (*M. D. G.* 1908, 217, 218.) Araliaceae. H. A new species differing from *A. ricinifolium* especially by its leaves, which are more erect, stiffer, larger, and less deeply lobed. Country not stated. (E. Schelle, Tübingen, Germany.)

***Acer laetum aureum.** (*Hesse Cat.* 1909–10, 71.) Sapindaceae. H. A beautiful form with red and golden-yellow leaves. (H. A. Hesse, Weener, Hanover.)

***Acer neglectum Annae.** (*M. D. G.* 1908, 216, 218, col. t.) H. Young leaves dark blood-red, afterwards changing to olive-colour. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Acer neglectum Friderici. (*M. D. G.* 1908, 216, 218, col. t.) H. Young leaves white-yellow, later shining golden-yellow, with reddish veins and petiole. (Fritz Graf v. Schwerin.)

Acer palmatum cristatum. (*Hesse Cat.* 1909–10, 72, f.) H. A weak-growing variety remarkable in having crested leaves. (H. A. Hesse, Weener, Hanover.)

Acer tegmentosum. (*M. D. G.* 1909, 294.) H. A robust plant with densely glaucous branches. Leaves 3-lobed, nearly 6 in. long and 4 in. broad; lobes not reaching to the middle, acuminate; petiole 1¾ in. long, purple-red. Amur Region. (H. A. Hesse, Weener, Hanover.)

***Aconitum Vilmorini.** (*R.H.* 1909, 533; *J. S. H. F.* 1909, 585.) Ranunculaceae. H. The correct name for the plant included in the list of 1908 as *A. volubile latisectum*. China. (Vilmorin-Andrieux & Co., Paris.)

***Acriopsis latifolia.** (*K. B.* 1909, 368.) Orchidaceae. S. Distinguished by having leaves several times broader than in any other known species. They are broadly oblong, 4–8 in. long, 1¼–2¼ in. broad. Flowers very small, whitish-yellow, with red-purple stripes and spots on the sepals and petals, and red-purple papillae on the disc of the lip. Straits Settlements. (Kew.)

Adiantum elegans × fragrantissimum. (*Gfl.* 1909, 198.) Filices. S. A garden hybrid. (O. Bernstiel, Bornstedt, Potsdam, Germany.)

***Adiantum grossum.** (*G. C.* 1909, xlv. 51, ff. 30–31.) G. Fronds pinnate, in a dense tuft, gracefully curved when full grown, up to 25 in. long; pinnae about 25, rather regular, somewhat reniform or semi-orbicular, shortly stalked, the largest 2 in. long and 1½ in. broad, almost leathery, rich green. The species is nearest *A. Balfouri*, but the fronds are larger and are not proliferous at the apex. Colombia. (F. Sander & Sons.)

Agave littaeoides. (*B. T. O.* 1909, 143, f. 4.) Amaryllidaceae. G. A new species allied to *A. Scolymus* in its leaves and flowers. Stemless. Leaves about 30, spathulate, 10–11 in. long, 3¾ in. broad, glaucescent, strongly prickly-toothed, terminated by a stout spine; prickles grey or brown, for the most part hooked and turned towards the apex of the leaf. Scape simple, about 8 ft. high. Inflorescence spike-like, about 20 in. long. Flowers in fascicles of 7–12, greenish-yellow. Perianth-tube funnel-shaped, 7½ lin. long; lobes linear, half as long as the tube. Country unknown. (Florence B. G.)

***Agave Wrightii.** (*B. M.* t. 8271.) G. A new species of the *Littaea* section allied to *A. geminiflora*. It has been cultivated under the erroneous name of *A. Taylori*. Trunk short. Leaves somewhat flexible, more or less erect when young, 16–18 in. long, tapering to a fine spine-tipped point; margins sharp, without teeth or prickles, horny on border, which finally shreds into hair-like filaments. Scape about 10 ft. high. Spike about 7 ft. long. Perianth-lobes about 8 lin. long, dark green, with cream-white borders. Central America. (Kew.)

Aloe Marlothii. (*G. C.* 1909, xlvi. 309.) Liliaceae. G. A species with extremely spiny leaves and nearly horizontally spreading flower-spikes. British Bechuanaland. (La Mortola, Italy.)

***Aloe rubrolutea.** (*B. M.* t. 8263.) G. A handsome species with a stout unbranched stem 8 ft. high or more. Leaves about 20, in a dense rosette, lanceolate-ensiform, about 2 ft. long, 4½ in. broad, glaucous-green, the margins beset with brown deltoid and somewhat hooked spines. Inflorescence much-branched. Racemes about 1 ft. long. Perianth straight, cylindric, bright red, 1¼ in. long, the inner segments with dark brown tips. Trop. S. W. Africa. (La Mortola, Italy.)

***Amaryllis Parkeri.** (*G. C.* 1909, xlv. 92; *J. R. H. S.* xxxv. 225.) Amaryllidaceae. G. or H. H. The name suggested for the garden hybrid between *Amaryllis Belladonna* var. *blanda* and *Brunsvigia Josephinae*, which has been in cultivation at Kew since 1889 and is known as the "Kew Belladonna."

***Amelanchier utahensis.** (*Späth Cat.* 1909–10, 77.) Rosaceae. H. A small densely branched shrub. Branches with a brown bark. Leaves cordate, acute, 1–1¾ in. long, coarsely crenate, grey-green. Utah, U.S.A. (L. Späth, Berlin.)

***Androcymbium melanthoides.** (*G. C.* 1909. xlv. 315, f. 134.) Liliaceae. G. Bulb like that of a minute tulip. Leaves 2–4, lanceolate, 3–9 in. long, with long subterranean sheaths. Flowers small, numerous, on short stalks, borne in clusters in the axils of large conspicuous bracts, some of which are white with longitudinal green veins, and the largest 3½ in. long and 2 in. broad. S. and Central Africa. (W. E. Gumbleton.)

***Angadenia nitida.** (*B. M.* t. 8233.) Apocynaceae. S. A climbing glabrous shrub. Leaves oblong or elliptic, 4–6 in. long, 1¼–2½ in. broad, slightly cordate at the base, entire; petiole ⅓–½ in. long. Inflorescences axillary, raceme-like, pedunculate. Flowers nodding, on pedicels ½–¾ in. long. Corolla yellow, with a vermilion band below the middle of the narrow tube, 1½ in. long; lobes oblique, ovate-rounded, ½ in. long. Trop. S. America. (Kew.) [Syn. *Echites nitida*, Vahl; *Odontadenia nitida*, Muell.-Arg.]

Angraecum expansum. (*G. C.* 1909, xlv. 386; *J. of H.* 1909, lviii. 522.) Orchidaceae. S. An erect-growing

species, with leathery distichous leaves. Inflorescence short, 2-flowered. Flowers white, thick in texture and peculiar in form, with the spur longer than the perianth-segments and curved back. Mascarene Islands. (Sir Trevor Lawrence.)

***Anthurium trinerve.** (*B. M.* t. 8251.) Araceae. S. A herb with an erect rooting stem 4–12 in. high. Leaves lanceolate, acute, cuneate at the base, 4–7 in. long, 1–3 in. broad; petiole 1–4 in. long. Spathe erect or slightly spreading, ovate, acute, green, $\frac{3}{5}$–$\frac{4}{5}$ in. long. Spadix up to 2 in. long. Berries far-exserted, ellipsoid, lilac, $\frac{1}{3}$–$\frac{1}{2}$ in. long. Brazil and Guiana. [This is *A. trinerve*, Miq. and is distinct from *A. trinervium*, Kunth. It has been cultivated for many years at Kew.]

Asparagus Leonis. (*B. T. O.* 1909, 113.) Liliaceae. G. Plant densely branched, unarmed, of a bright emerald green. Cladodes grouped on one side, 6 or 7 together, linear, falcate. Flowers small, white or yellowish, followed by abundant fruit. S. Africa. (C. Sprenger, Naples.)

***Asparagus tetragonus.** (*B. M.* t. 8288.) G. A climbing undershrub; roots bearing numerous elliptic tubers 1¼ in. long, ⅔ in. thick. Stem armed with stout decurved woody thorns 6 lin. long. Cladodes usually in fascicles of 5, linear, 3- or 4-angled, 7 lin. long. Racemes rather numerous, 2½ in. long. Perianth white; segments obovate, 1½ lin. long, obtuse. S. Africa. (Kew.) [Syn. *A. racemosus*, Willd. var. *tetragonus*, Baker.]

***Aster Amellus roseus.** (*R. H.* 1909, 117.) Compositae. H. Flower-heads rose-coloured. (Cayeux and Le Clerc, Paris.)

***Aster Mesa grandiflorus.** (*G. C.* 1909, xlv. 419; xlvi. 53, f. 26; *G. M.* 1909, 518.) H. A garden name for a handsome variety of *Erigeron macranthus*. It is an erect bushy plant about 2 ft. high, with bright purple flower-heads 1–2 in. across. (W. Cutbush & Sons.)

Astilbe rivularis gigantea. (*G. C.* 1909, xlvi. 135; *G. M.* 1909, 672.) Saxifragaceae. H. A very large-growing form, the inflorescences reaching a height of about 5 ft. Flowers cream-coloured. (A. Perry.)

***Baikiaea insignis.** (*K. B.* 1909, 342.) Leguminosae. S. An erect evergreen tree reaching a height of 30–40 ft. Leaves abruptly pinnate, 1–2 ft. long, leathery; pinnae slightly oblique, elliptic, 6–12 in. long, up to 4 in. broad. Flowers (when fully expanded) 10 in. across. Calyx 4–5 in. long, with 4 linear segments. Lower petal or lip lemon-yellow; other petals snow-white. The flowers, which are very fugacious, are the largest known in the Leguminosae. W. Trop. Africa. (Kew.)

***Begonia Patriae.** (*G. M.* 1909, 70.) Begoniaceae. G. A garden hybrid between *B. socotrana* and *B. Pearcei*. (V. Lemoine & Son, Nancy.)

***Berberis approximata.** (*K. B.* 1909, 256.) Berberidaceae. H. This is the plant figured in *B. M.* t. 7833 as *B. dictyophylla*. It differs from the true *B. dictyophylla*, Franch. in having the leaves usually denticulate, the flowers much smaller, and the glands of the petals close together. China. (Kew.)

***Berberis Gagnepainii.** (*G. C.* 1909, xlvi, 225, f. 226.) H. An evergreen shrub 3–6 ft. high. Leaves lanceolate, 2–4 in. long, ¼–¾ in. broad, tapering very much towards the apex, coriaceous, spiny on the margin; spines at the bases of the leaves tripartite, ½–⅔ in. long. Flowers in fascicles of usually 5–9, delicate yellow, borne on red pedicels. Fruits ellipsoid, glaucous purple. This is figured in *B. M.* t. 8185 as *B. acuminata*, but the true *B. acuminata*, Franch. is less compact in habit, has larger coarser and thicker leaves, and stouter spines. China. (J. Veitch & Sons.)

Betula Koehnei. (*Späth Cat.* 1909–10, 80.) Cupuliferae. H. A hybrid between *B. pendula* and *B. papyracea*. (L. Späth, Berlin.)

Bolusanthus speciosus. (*S. C. A. A. Cat.* 1908, 14.) Leguminosae. G. Tree up to 25 ft. high. Leaves petiolate, 4–10 in. long; leaflets in 3–6 pairs, obliquely lanceolate, 2–3 in. long, 5–10 lin. broad. Racemes terminal, recurved-pendulous, 3–4½ in. long, 10–30-flowered. Flowers handsome, bright blue, about ¾ in. long. S. Africa. (Southern California Acclimatizing Association.) [Syn. *Lonchocarpus speciosus*, Bolus in Journ. Linn. Soc. xxv. 161.]

***Bomarea Wercklei.** (*Lemoine Cat.* 1909, n. 173, 3.) Amaryllidaceae. G. Stems sarmentose. Leaves lanceolate, acuminate, bright green. Flowers about 12, in a terminal umbel; outer segments vermilion-orange; inner broad, rounded, orange-yellow. Mountains of Costa Rica. (V. Lemoine & Son, Nancy.)

Brasso - cattleya sandhaghensis. (*O. R.* 1909, 241, f. 19.) Orchidaceae. S. A garden hybrid between *Brassavola Digbyana* and *Cattleya Schilleriana*. (G. H. Müller, Huis Sandhaghe, Den Haage, Holland.)

Brasso-cattleya Susannae. (*O. R.* 1909, 137, f. 11.) S. A garden hybrid between *Cattleya Thayeriana* and *Brassavola Digbyana*. E. O. Orpet, South Lancaster, Mass., U.S.A.)

Brasso - laelio - cattleya Cooksonii. (*G. C.* 1909, xlv. 108, 141.) Orchidaceae. G. A garden hybrid between *Brassolaelia Gratrixiae* and *Cattleya Dowiana*. (N. C. Cookson.)

Brunsvigia Josephinae × Amaryllis Belladonna. (*G. C.* 1909, xlv. 57, suppl. ill.) Amaryllidaceae. G. or H. H. A garden hybrid of which the *Brunsvigia* is the seed-parent. (C. G. van Tubergen, Jun., Haarlem.) [See **Amaryllis Parkeri.**]

***Bulbophyllum campanulatum.** (*K. B.* 1909, 62; *B. M.* t. 8281.) Orchidaceae. S. An elegant little plant, with closely-set ovoid-oblong 1-leaved pseudobulbs, ¾–1 in. long. Leaves oblong, obtuse, leathery, 3–3½ in. long, about ¾ in. broad, purple beneath. Scapes slender, suberect, decurved at the apex, 3 in. long, about 10-flowered. Flowers umbellate, radiating so as to form a somewhat campanulate inflorescence. Dorsal sepal and petals very pale whitish-yellow, with dull purple stripes, 2–3 lin. long. Lateral sepals pale pink, with dark dots, 8 lin. long. Lip dull reddish-purple, 1½–2 lin. long. Sumatra. (Kew.)

Bulbophyllum nudiscapum. (*K. B.* 1909, 365.) S. Near *B. barbigerum*. Pseudobulbs 4-angled, broadly oblong, about 2 in. long, 1-leaved. Leaves oblong, 4½–6 in. long, 1¼–1¾ in. broad. Scapes 12–20 in. long. Racemes elongated, many-flowered. Sepals subconnivent, scarcely ½ in. long, green, with dark brown markings at the base. Petals bristle-like, very small. Lip scarcely ½ in. long, linear, dilated and folded at the base, purple, copiously hairy. Sierra Leone; Congo. (A. Imschoot, Mont - St. - Amand, Ghent.)

Calanthe Hennisii. (*G. C.* 1909, xlvi. 34.) Orchidaceae. S. A new species resembling *C. vestita*, but it differs in having the scape, pedicels and back of the sepals more villous, and the lobes of the lip are rather narrower, while the bracts are relatively broader. Flowers slightly smaller, white, with a slight tinge of sulphur, and with a yellow throat to the lip. Philippines. (W. Hennis, Hildesheim, Germany.)

***Calathea Louisae.** (*B. S. B. F.* 1908, Sess. extr. xlii.) Scitamineae. S. Plant nearly 3 ft. high. Leaves ovate or ovate-lanceolate; blade up to 9 in. long and 3¾ in. broad, blotched above on both sides of the midrib with whitish - green, beautiful red beneath; petiole up to 2 ft. long. Spike radical, sessile, ovate or cylindric, 2½ in. long, pure white; bracts 5–10, transversely elliptic. Flowers nearly 1 in. long. Country unknown. (Chantrier frères, Mortefontaine, France; Paris B. G.) [Syn. *Maranta Louisae*, Hort.]

Calceolaria profusa. (*G. C.* 1909, xlv. 332.) Scrophulariaceae. G. A tall-growing free-flowering plant resembling *C. Burbidgei*. (L. Sutton.) [= *C. Clibrani*.]

Calla Rehmanni × Elliottiana. (*G. C.* 1909, xlvi. 162, f. 68.) Araceae G. A garden hybrid. (A. Ragionieri, Castello, Florence.)

Callista amabilis. (*G. C.* 1909, xlvi, 354, 431.) Orchidaceae. S. Very similar to some of the species of *Dendrobium*. Flowers borne on the leafless stems of the previous year, about 1 in. across, white, changing to very pale lilac. Sepals united at the base, bearing on the reverse side a vivid pea-green spot. Lip deeply saccate at the base, entire. Mentum absent. Annam. (H. Goldschmidt, Essen, Germany.) [Syn. *Dendrobium amabile*, O'Brien; G. C. 1909, xlvi. 393.]

Caltha palustris Tyermani. (*G. M.* 1909, 415, f.) Ranunculaceae. H. A dwarf form with golden-yellow flowers. (R. Wallace & Co.)

Campanula pyramidalis compacta. (*Gard.* 1909, 52, 54, f.) Campanulaceae. H. Much dwarfer than the type. Flowers much larger and of greater substance. (Duke of Northumberland.)

Campanula pyramidali-versicolor. (*J. S. H. F.* 1909, 431; *R. H.* 1909, 390.) H. A garden hybrid between the species indicated in the name. (Cayeux and Le Clerc, Paris.)

Caragana Boisi. (*Späth Cat.* 1909–10, 82.) Leguminosae. H. The correct name for the plant included in the list of 1904 as *C. microphylla* var. *crasse aculeata*. It is quite distinct from *C. microphylla*, but is allied to

C. arborescens, differing in having stouter spines, more or less persistent leaflets of firmer texture, and pubescent ovary and young fruit. See *Schneider, Ill. Handb. Laubholzk.* ii. 96, f. W. China. (M. L. de Vilmorin, Les Barres, France; L. Späth, Berlin.)

***Carrierea calycina.** (*Lemoine Cat.* 1909, n. 173, v.; *K. B.* 1909, 353, as *Carrieria*.) Bixaceae. H.? A deciduous tree 20–40 ft. high, with a wide-spreading head of branches. Leaves petiolate, ovate, up to 5 in. long, shortly and abruptly acuminate, coarsely crenate. Panicles terminal, 6 in. long. Flowers cup-shaped, ¾–1 in. across, very pubescent, bluish-white. Fruit a capsule, 3–4 in. long, pubescent. China. (Arnold Arboretum.) [This was included in the list of 1896, but the seeds distributed in Europe about that date failed to germinate.]

Catasetum Trulla var. **flavo-viride.** (*Orch.* 1909, 126.) Orchidaceae. S. Sepals, petals and lip yellow-green, the apex of the petals and upper surface of the lip brown-dotted, the latter yellow at the base, with the lateral lobes minutely fimbriate. (H. Goldschmidt, Essen, Germany.)

Cattleya Lambeauiae. (*R. H. B.* 1909, 369; *T. H.* 1909, 754.) G. Orchidaceae. A garden hybrid between *C. Trianae alba* and *C. Hardyana alba*. (F. Lambeau, Brussels.)

Cattleya Pletzii. (*Orch.* 1909, 19.) G. A garden hybrid between *C. granulosa* and *C. Percivaliana*. (T. Franke, Gross-Ottersleben, Magdeburg, Germany.)

Cattleya Roupelliana. (*G. C.* 1909, xlvi. 205.) G. A garden hybrid between *C. superba* and *C. Hardyana*. (R. G. Thwaites.)

Cattleya Trianae var. **Holmesii.** (*G. C.* 1909, xlv. 124; *O. R.* 1909, 87.) G. A finely-shaped flower, with broad petals and a rich rose-purple lip. (J. McCartney.)

Cattleya Verdonckiana. (*R. H. B.* 1909, 241; *T. H.* 1909, 469.) G. A garden hybrid between *C. resplendens* and *C. Warneri*. (F. Lambeau, Brussels.)

Celastrus angulatus. (*B. T. O.* 1909, 226, f. 7.) Celastraceae. H. A shrub 23 ft. high or more, with long trailing shoots. Leaves orbicular or elliptic, 4–7 in. across, deep green. Flowers inconspicuous. China. (A. Biondi, Castelfalfi, Montaione, Italy.)

***Celastrus flagellaris.** (*Hesse Cat.* 1909–10, 193; *M. D. G.* 1909, 284.) H. A rapid-growing climbing species, with very short hook-like thorns. Amur Region; Corea. (H. A. Hesse, Weener, Hanover.)

Centema biflora. (*G. C.* 1909, xlvi. 147, f. 61.) Amarantaceae. G. Stem erect, 2–3 ft. high, slender; nodes swollen. Leaves opposite, linear-lanceolate, up to 3 in. long and ½ in. broad. Inflorescence a terminal pedunculate spike, 2–3 in. long and ½ in. broad, dull magenta. Flowers small, mixed with numerous membranous bracts. The plant resembles in habit a tall-growing *Dianthus*. Trop. Africa. (Chelsea B. G.)

Cephalocereus De Laetii. See **Echinocereus De Laetii.**

Cephalostachyum pergracile. (*S. C. A. A. Cat.* 1908, 5.) Gramineae. G. A very elegant bamboo. It grows in clumps and reaches a height of 40 ft. Stems 2–3 in. thick. Leaves up to 14 in. long. Burma. (Southern California Acclimatizing Association.)

Cercestis congensis. (*R. H. B.* 1909, 381.) Araceae. S. Climbing and rooting at the nodes. Leaves long-stalked; blade 7 in. long and nearly as broad; petiole 8–12 in. long. Fruiting-peduncle about half as long as the petiole. Spadix somewhat shorter than the peduncle. Fruits red. See *Engl. Bot. Jahrb.* xv. 448. Congo. (Brussels B. G.)

Cereus Guelichii. (*M. K.* 1909, 17, f.) Cactaceae. G. Stem sinuous, climbing, scarcely branched, dark green. Ribs usually 3, undulate, sharp. Areolae very small, clothed with white felt. Radial spines 4 or 5, the 2 upper strongest, ¾–1 in. long, the rest 2–2½ in. long and often disappearing with age; central spine solitary, ¾–1 in. long. Flower 8–10 in. long, faintly rose-scented; outer perianth-segments green, 2–4½ in. long; inner white, up to 4 in. long. Fruit red-violet, almost globose, spineless. Paraguay and Argentina. (Darmstadt B. G.)

Cereus lepidanthus. (*M. K.* 1909, 177.) G. Stems slender, less than 3½ in. thick, up to 13 ft. long. Ribs 7–9, slightly raised, separated by flat trough-like furrows. Areolae ⅔ in. apart, circular, scarcely ¼ in. across. Radial spines 10 at most, 5–8 lin. long, all bent towards the stems; upper often wanting and replaced by 2 of the 5 central spines, the lowermost of which is directed outwards and is up to 2½ in. long. Flower cylindric, 3 in.

long, 1 in. broad, persisting a long time; outer perianth-segments yellow-green, with carmine margins; inner fire-red below and clouded with yellow, sepia-brown on the upper membranous half. Guatemala. (Cultivated in Germany?)

Cereus Purpusii. (*M. K.* 1909, 150.) G. Stems branched, climbing, rooting; joints long, sharply 3- or 4-angled, horny on margins; angles subcrenate. Areolae small, tomentose. Spines 3–6, very minute, very rough. Flowers funnel-shaped, about 10 in. long and 8 in. across in the broadest part; outer perianth-segments narrow, purplish; middle golden; innermost broad, white, golden at the acuminate apex. Mexico. (Darmstadt B. G.)

Cereus saxicola. (*M. K.* 1909, 75, f.) G. Stems slender, erect or reclinate, cylindric, branched. Ribs 6–9, low, at first rounded, then subacute, somewhat curved. Areolae scarcely ½ in. apart, clothed with short yellow-grey wool. Radial spines 5-8; central spines 1–3, larger. Flowers nearly 5 in. long; outer perianth-segments broadly linear-lanceolate, greenish-white, brown-tipped, with green midrib; inner narrower, white, with a green tint. Argentina. (Darmstadt B. G.)

***Ceropegia barbertonensis.** (*G. C.* 1909, xlvi. 101.) Asclepiadaceae. S. Leaves sometimes variegated with pale green along the veins. Flowers similar in shape to those of *C. Woodii* and *C. debilis*. Transvaal. (W. E. Ledger.)

***Ceropegia Brownii.** (*K. B.* 1909, 326.) S. Stem twining, glabrous. Leaves spreading, ¾–2 in. long, ½–1 in. broad, lanceolate or ovate, scarcely fleshy, glabrous; petiole 2½–5 lin. long. Peduncles lateral, 5–6 lin. long, 1- or 2-flowered. Corolla-tube about 1¾ in. long, inflated at the base, constricted above the middle, cylindric above, abruptly dilated at the apex, pale green, with dark blotches; lobes erect-connivent, 7 lin. long, greenish, with a zone of white and dark purple in the middle. Uganda. (W. E. Ledger.)

***Ceropegia discreta.** (*K. B.* 1909, 262.) S. A tuberous herb; stem twining, slender, glabrous. Leaves petiolate, linear-lanceolate, 2½–4 in. long, ¼–⅓ in. broad, coriaceous or somewhat fleshy. Umbels lateral, pedunculate, 2–8-flowered. Corolla 1¼ in. long, curved; tube elliptic-oblong, inflated at the base, whitish, dark-veined, cylindric above and purple; lobes connate at the apex, ¼ in. long, ovate-lanceolate, pale yellow at the base, purple-green at the apex. Madras. (Kew.)

***Ceropegia Rendallii.** (*G. C.* 1909, xlvi. 101.) S. A small twining species, with a remarkable flower having an umbrella-like canopy surmounting the corolla. Transvaal. (W. E. Ledger.)

Chamaecyparis Lawsoniana pulcherrima. (*Hesse Cat.* 1909–10, 255.) Coniferae. H. A loosely-branched form with white glistening leaves. (H. A. Hesse, Weener, Hanover.) [*Cupressus.*]

Chamaecyparis Lawsoniana schongariensis. (*Hesse Cat.* 1909-10, 255.) H. Branches spreading, lax, sickle-shaped, with the young growths a glistening steel-green. (H. A. Hesse, Weener, Hanover.) [*Cupressus.*]

Chamaecyparis Lawsoniana spiralis. (*M. D. G.* 1909, 268, 327.) H. Remarkable in having the stem spirally twisted. (Prince M. Lobkowitz, Eisenberg, Bohemia.) [*Cupressus.*]

Chamaedorea bambusoides. (*S. C. A. A. Cat.* 1908, 1.) Palmae. S. Stems tufted, thin, reed-like, with feathery light-green leaves. Honduras. (Southern California Acclimatizing Association.)

Cheiranthus Allionii hybrida. (*G. C.* 1909, xlv. 331.) Cruciferae. H. Flowers brownish-yellow, about the size of those of the common wallflower. (Miss Willmott.)

Chlorophytum Huyghei. (*R. H. B.* 1909, 381.) Liliaceae. S. Leaves about 14, in a basal tuft; blade lanceolate, 12 in. long, 2–2½ in. broad; petiole about 7 in. long. Raceme bracteate, 10–32 in. long. Pedicels slender, about ⅓ in. long. Flowers greenish-white, about ¼ in. long. See *Ann. Mus. Congo*, Bot. ser. 5, iii. 55, t. 1. Congo. (Brussels B. G.)

Cineraria flavescens. (*G. C.* 1909, xlv. 268, 300, 322, f. 139; *G. M.* 1909, 371; *Gard.* 1909, 247, 252, f.) Compositae. G. A garden hybrid between *Cineraria* "Feltham Beauty" and *Senecio auriculatissimus*. (J. Veitch & Sons.)

***Cirrhopetalum longissimum.** (*G. C.* 1909, xlvi. 364; *O. R.* 1909, 373.) Orchidaceae. Scape slender, bearing an umbel-like inflorescence of about 7 flowers. Lateral sepals closely approximate, 9–12 in. long, cream-white,

with 5 lilac-pink stripes, terminating in slender tails. Upper sepal arched over the lip, white, with purple lines. Petals small, similarly coloured. The species is probably nearest allied to *C. grandiflorum*, and is remarkable for its very long lateral sepals. Siam. (Sir Trevor Lawrence.)

Cirrhopetalum pulchrum var. **Cliftonii.** (*G. C.* 1909, xlvi. 136; *J. of H.* 1909, lix. 219, f.; *O. R.* 1909, 328, f. 26.) S. Flowers in large umbels, cream-white, profusely spotted with deep rose. Dorsal sepal furnished with a bristle-like appendage. (Charlesworth & Co.)

***Clematis montana Wilsonii.** (*G. C.* 1909, xlvi. 173.) Ranunculaceae. H. A late summer- or autumn-flowering form. China. (J. Veitch & Sons.)

Cleome gigantea hybrida. (*R. H.* 1909, 195.) Capparidaceae. S. The tall stems terminate in large umbels of flowers which vary in colour from pure white to lilac or purple. (E. Thiébaut, Paris.)

***Clerodendron ugandense.** (*B. M.* t. 8235.) Verbenaceae. G. A new species allied to *C. myricoides* (*B. M.* t. 5838), from which it differs in having much shorter semi-orbicular calyx-lobes, a shorter corolla-tube and larger more deeply coloured corolla-lobes. Flowers violet-blue, in lax panicle-like cymes. Corolla-tube about ¼ in. long; lobes unequal, the lowermost concave, ¾ in. long, the others flat, ⅓ in. long. British E. Africa. (Kew.)

***Cocos Arechavaletana.** (*S. C. A. A. Cat.* 1908, 1.) Palmae. S. Similar to *C. Romanzoffiana*, but it grows taller and makes larger crowns. Uruguay. (Southern California Acclimatizing Association.)

***Cocos campestris.** (*S. C. A. A. Cat.* 1908, 1.) S. Only 10–15 ft. high. Leaves gracefully recurved. S. Brazil. (Southern California Acclimatizing Association.)

Cocos pulposa. (*S. C. A. A. Cat.* 1908, 2.) S. Very similar to *C. eriospatha*, but it bears in profusion larger fruits which have a delicious pulp. S. Brazil. (Southern California Acclimatizing Association.)

***Coprosma Petriei.** (*G. C.* 1909, xlvi. 341.) Rubiaceae. H. A small growing plant, forming a dense cushion as compact as a thyme. Fruits purplish. New Zealand. (Glasnevin B. G.)

Coreopsis radiata. (*J. S. H. F.* 1909, 476.) Compositae. H. Apparently of garden origin. Plant very dwarf. Flower-heads with the ray-florets rolled up. (Fortin & Laumonnier, Paris.)

Cornus alba splendens. (*M. D. G.* 1909, 326, 327.) Cornaceae. H. Remarkable for its intensely scarlet-red branches and branchlets. New York. (R. Demoker, New York.)

***Cornus controversa.** (*B. M.* sub t. 8261; *K. B.* 1909, 331.) H. A new name for the plant cultivated in England as *C. brachypoda* and in other countries as *C. macrophylla*. It has alternate leaves and branches, while the true *C. macrophylla*, Wall., with which *C. brachypoda*, C. A. Mey, is synonymous, has opposite leaves and branches. India; China; Japan Corea.

Corydalis Wilsoni-thalictrifolia. (*J. S. H. F.* 1909, 232.) Papaveraceae. H. A garden hybrid between the species named. (Ph. L. de Vilmorin, Verrières-le-Buisson, France.)

***Cotoneaster moupinensis** forma **floribunda.** (*B. M.* t. 8284.) Rosaceae. H. The name given to the plant included in the list of 1904 as *C. bullata*. It only differs from typical *C. moupinensis* by having more flowers in the corymbs.

Craspedia alpina. (*Gard.* 1909, 347.) Compositae. H. H. Similar to the following in growth and habit, but the flower-heads are white and the leaves a brighter green. New Zealand. (Glasnevin B. G.) [*C. uniflora* var. *lanata*, Cheesem.]

***Craspedia uniflora.** (*Gard.* 1909, 347.) H. H. Leaves in a rosette, 3–6 in. long, hairy above, densely white-tomentose beneath, white on the margin. Flower stems up to 1 ft. high, terminated by a solitary globose deep yellow flower-head 1–1½ in. across. Florets all tubular. New Zealand. (Glasnevin B. G.)

***Crocus Sieberi versicolor.** (*G. C.* 1909, xlv. 205; *G. M.* 1909, 266; *Gard.* 1909, 171, 201, f.) Iridaceae. H. Outer perianth-segments white, feathered with purple or dark violet; inner white, yellow at the base inside. Stigmas deep orange. (G. Reuthe.)

Cycnoches densiflorum. (*K. B.* 1909, 63; *O. R.* 1909, 104, f. 9; *B. M.* t. 8268.) Orchidaceae. Pseudobulbs erect, about 6 in. long. Leaves oblong-

lanceolate, acute or acuminate, 5–6½ in. long, 1¼–1¾ in. broad. Racemes of both sexes produced by the same pseudobulb; male pendulous, about 14 in. long, many-flowered; female suberect, 2 in. long, 2-flowered. Flowers diverse in shape, size and colour, ¾–1¾ in. long, the female green, with an ivory-white lip, and the male lighter green or yellow-green, with brown spots. Colombia. (Rev. J. C. B. Fletcher.)

Cymbidium Tracyanum × elegans. (*G. C.* 1909, xlv. 333.) Orchidaceae. G. A garden hybrid. (J. Forster Alcock.)

Cypripedium ardwickense. (*G. C.* 1909, xlv. 30.) Orchidaceae. S. A garden hybrid of unknown parentage. (E. Rogerson.) [*Paphiopedilum.*]

Cypripedium argentum. (*G.C.* 1909, xlvi. 239.) S. A garden hybrid between *C. Stonei* and *C. Chamberlainianum.* (Rev. J. Crombleholme.) [*Paphiopedilum.*]

Cypripedium Boltonii. (*G. C.* 1909, xlvi. 364, 407; *G. M.* 1909, 947; *J. of H.* 1909, lix. 529, f.) G. A garden hybrid probably between *C. insigne Sanderae* and *C. niveum.* The flowers are wax-like and of the purest white, with a few minute dark dots on the lower part of the dorsal sepal. (W. Bolton; J. H. Craven.)

Cypripedium callosum viride. (*Orch.* 1909, 19.) S. Flowers greenish. (O. Beyrodt, Marienfelde, Berlin. [*Paphiopedilum.*]

Cypripedium Charlesworthii Bromilowiae. (*G. C.* 1909, xlv. 46.) S. Flowers pale green and pure white. (H. J. Bromilow.) [*Paphiopedilum.*]

Cypripedium Durandianum. (*T. H.* 1909, 270.) S. A garden hybrid between *C. ciliolare* and *C. Godefroyae leucochilum.* (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium Hartleyanum. (*O. R.* 1909, 178.) S. A garden hybrid between *C. Godefroyae* and *C. Chamberlainianum.* (Keeling & Sons.) [*Paphiopedilum.*]

Delphinium Moerheimei. (*G. C.* 1909, xlv. 419; *G. M.* 1909, 518, 628, 631, f.) Ranunculaceae. H. A hybrid between *D. sinense album* [*D. grandiflorum*] and a garden variety. (W. Cutbush & Sons.)

***Dendrobium acuminatum.** (*G. C.* 1909, xlvi. 136, 150, f. 64; *G. M.* 1909, 659, 672, f.) Orchidaceae. S. A dwarf-growing species allied to *D. Treacherianum.* Racemes elongated. Flowers more than 2 in. across, white, delicately tinted with rose-pink. Philippines. (Moore, Ltd.)

Dendrobium amabile. See **Callista amabilis.**

Dendrobium atro-Brymerianum. (*G. C.* 1909, xlv. 141; *O. R.* 1909, 91.) S. A garden hybrid between *D. atro-violaceum* and *D. Brymerianum.* (R. G. Thwaites.)

Dendrobium Goldschmidtii. (*O. R.* 1909, 63.) S. A pretty new species, reaching over a foot in height. Racemes short, axillary, about 12-flowered. Flowers about ½ in. long, deep rose-purple. Formosa. (H. Goldschmidt, Essen, Germany.)

Dendrobium muricatum var. **munificum.** (*O. R.* 1909, 347; *G. C.* 1909, xlvi. 174, as *D. muricatum.*) S. Plant of robust habit. Pseudobulbs ovoid-oblong, 1- or 2-leaved. Leaves coriaceous, elliptic-oblong. Inflorescence terminal, arching, about 8 in. long, many-flowered. Flowers about 1 in. across. Sepals and petals cream-white or greenish-white, marked with brownish-purple. Lip narrow, crimped on the front half, purple at the base, yellow in front. New Caledonia. (Glasnevin B. G.)

***Dendrobium Sanderae.** (*G. C.* 1909, xlv. 374, f. 163; xlvi. 100; *G. M.* 1909, 621, 634, f.; *O. R.* 1909, 209, f. 17.) S. A new species allied to *D. Dearei.* Stems 1½–3 ft. long, very leafy, striate, thickened below the middle. Leaves oblong, 1¾–2 in. long, 5–7½ lin. broad, slightly bilobed at the apex. Racemes short, lateral on the upper part of the stem, 3- or 4-flowered. Pedicels about 1¾ in. long. Sepals pure white, lanceolate or oblong-lanceolate, 1¼–2 in. long; spur about 1¼ in. long, blackish-violet inside. Petals pure white, 1½ in. long, 1 in. broad. Lip 3-lobed, about 1 in. across, white with green lines, blackish-purple on the side lobes and at the throat. Philippines. (F. Sander & Sons.)

Dendrobium sanguinolentum album. (*G. C.* 1909, xlvi. 195.) Flowers white when fully developed. (J. Geddes.)

Dendrobium taurinum Colmanii. (*G. C.* 1909, xlvi. 268; *G. M.* 1909, 813, 828, f.) S. Sepals reflexed, clear

white. Petals erect, twisted, rose-pink. Lip shovel-shaped, white, margined with rose. Philippines. (Sir J. Colman.)

Dendrochilum glumaceum var. validum. (*O. R.* 1909, 81, f. 8.) Orchidaceae. S. Stouter in habit than the type, with much broader leaves. Philippines. (G. Shorland Ball.)

Deutzia crenata magnifica. (*Lemoine Cat.* 1909, n. 173, vi. f.) Saxifragaceae. H. A garden hybrid between *D. crenata candidissima plena* and *D. Vilmorinae*. (V. Lemoine & Son, Nancy.)

Deutzia discolor elegantissima. (*Lemoine Cat.* 1909, n. 173, vi. f.) H. A garden hybrid between *D. scabra* and *D. discolor purpurascens*. (V. Lemoine & Son, Nancy.)

***Dianthus Pancicii.** (*G. C.* 1909, xlv. 809.) Caryophyllaceae. H. A tall-growing species, with sturdy erect flowering-stems reaching a height of 2½-3 ft. Leaves grass-like, in a dense basal tuft. Flowers light crimson, in a dense terminal head. The variety *grandiflorus* has stouter stems, larger flower-heads, and larger purple-carmine flowers. Bulgaria. (S. Arnott.)

Duvernoya Dewevrei. (*R. H. B.* 1909, 379.) Acanthaceae. S. A tufted herb growing to about 2 ft. high. Leaves petiolate, oblong. Inflorescence paniculate, 1¾–5 in. long. Corolla 2-lipped, about ½ in. long; upper lip white, with red stripes; lower lip greenish-white. See *Compt. Rend. Soc. Bot. Belg.* xxxviii. 102. Congo. (Laeken Col. G., Brussels.)

Echinocactus arizonicus. (*M. K.* 1909, 149, f.) Cactaceae. G. Stem at first globose, later depressed-globose, up to 1 ft. high. Ribs 21, obtuse, interrupted. Areolae up to 1¼ in. long and nearly ½ in. broad, ¾ in. apart. Radial spines 3, about 1 in. long; central 4, 1¼–2 in. long, the lowermost hook-like. Flowers 2-2½ in. across, purple. Arizona. (H. Frank, Frankfort-on-the-Main, Germany.)

Echinocereus De Laetii. (*M. K.* 1909, 131, 158.) Cactaceae. G. Tufted, the growths completely enveloped in long hair-like bristles. Ribs 17–20, deeply sinuate. Areolae oblong. Radial spines 30–36, rigid, tawny-whitish, the upper shorter than the lower; central 4 or 5, reddish, the lowermost longest, curved. Bristles 5 or 6, very long. Flowers rose. It resembles *Cephalocereus senilis*, but differs chiefly in the presence of radial spines and in having only 5 or 6 bristles to each areola. Mexico. (F. De Laet, Contich, Belgium.) [Syn. *Cephalocereus De Laetii*; M. K. 1909, 116, f. 129.]

Elsholtzia Stauntoni. (*M. D. G.* 1909, 288.) Labiatae. H. Shrubby at the base from which several annual shoots 3–5 ft. high are produced. Leaves broadly lanceolate, acuminate, rather coarsely toothed, glabrous above, whitish and thickly covered with golden dots beneath, aromatic, as well as the flowers. Panicle terminal, up to 12 in. long. Flowers purple-red, about ⅓ in. long, clothed with small purple-rose hairs. N. China. (Arnold Arboretum.)

***Encephalartos Barteri.** (*B. M.* t. 8232.) Cycadaceae. S. Stem short, rarely more than 1 ft. high, up to 9 in. across. Leaves erect or suberect, 3½–5½ ft. long, 9–10 in. broad towards the apex; petiole and rhachis clothed at first with a deciduous grey tomentum; leaflets usually about 80 pairs, rather close-set, linear-lanceolate, ½–¾ in. broad, pungent at the apex, few-toothed. Male cone narrowly cylindric, 5–9 in. long, pale. Female cone oblong-ellipsoid, 8 in. long, dark olive. Seeds 1¼ in. long; testa crimson. W. Trop. Africa. (Kew.)

Ennealophus amazonicus. (*K. B.* 1909, 361.) Iridaceae. G. Bulb about 1 in. long, ovoid. Stem 16–18 in. high, simple, glabrous. Leaves 4, linear-lanceolate, 6–12 (the uppermost 2) in. long. Spathe-bracts 2, ¾ in. long, surrounding about 6 flowers. Pedicels 1–1½ in. long, slender. Perianth about 1½ in. across, blue-violet, with pale brown claws to the segments, the inner of which have a triangular white blotch at the base of the blade. The genus is new and differs from *Tigridia* in having the style-branches 3-crested instead of bifid or subulate. The species resembles *T. violacea*. Brazil. (H. A. Tracy.)

Epicattleya Wolteriana. (*G. C.* 1909, xlv. 274.) Orchidaceae. G. A garden hybrid between *Epidendrum aurantiacum* and *Cattleya Schroederae*. (P. Wolter, Magdeburg, Germany.)

Epilaelia Lionetii. (*G. C.* 1909, xlv. 270; *G. M.* 1909, 332.) Orchidaceae. G. A garden hybrid between *Laelia purpurata* and *Epidendrum atropurpureum*. (Charlesworth & Co.)

***Eranthemum Wattii.** (*B. M.* t. 8239.) Acanthaceae. S. The correct name for the plant included in the list of 1901 as *Daedalacanthus Watti*, also in cultivation as *D. parvus*.

Eremospatha Haullevilleana. (*R. H. B.* 1909, 378.) Palmae. S. A slender climbing plant. Leaves pinnate, about 2 ft. long, obliquely truncate at the apex; rhachis prolonged into a whip-like prickly appendage; leaflets 8 or 9 each side, obovate, 4–9 in. long, prickly on the margin. See *Ann. Mus. Congo*, Bot. ser. 5, i. 96, tt. 33–34. Congo. (Brussels B. G.)

Eremurus robustus albus. (*Veitch Herb. P. Nov.* 1909–10, 1.) Liliaceae. H. Described as a great improvement on the variety *himalaicus*, being stronger in growth and having purer white flowers. (J. Veitch & Sons.)

Eria eriaeoides. (*O. R.* 1909, 95.) Orchidaceae. G. Stems numerous, finger-like, 2-4 in. long, 1- or 2-leaved. Leaves lanceolate, about 5 in. long and 1 in. broad, narrowed into rather a long petiole. Racemes lateral, erect, 2–3 in. long, hoary, bearing 6 to 9 small hoary dingy-purplish sessile or nearly sessile flowers. Queensland. (Kew.) [Syn. *Dendrobium eriaeoides*, F. M. Bailey.]

***Eria ochracea.** (*K. B.* 1909, 366.) S. Pseudobulbs cylindric, 4–7 in. long, 3–5-leaved at the apex. Leaves oblong or lanceolate-oblong, 3¾–7 in. long, 1–1¾ in. broad. Scapes terminal, about 4 in. long. Flowers greenish-yellow, with a slight brownish suffusion and an indistinct brown line on the petals. Sepals 7½ lin. long. Petals 5 lin. long. Lip mobile, 3-lobed, recurved, 5 lin. long. Malaya, probably Siam. (Kew.)

Erigeron speciosus grandiflorus. (*Veitch Herb. P. Nov.* 1909–10, 1.) Compositae. H. Flowers larger and deeper in colour than those of the variety *superbus*. (J. Veitch & Sons.)

***Erlangea tomentosa.** (*B. M.* t. 8269; *G. C.* 1909, xlvi. 97.) Compositae. G. A densely villous-tomentose shrub, up to 5 ft. high. Leaves oblong or oblong-lanceolate, 2–5 in. long, ¾–1¾ in. broad, doubly serrate; petioles 1–1½ in. long. Panicles corymbose, lax, pedunculate, about 6 in. across. Flower-heads lilac, about ⅔ in. across. Florets all tubular, ¼ in. long. Trop. E. Africa. (Kew.)

***Erythea Brandegeei.** (*S. C. A. A. Cat.* 1908, 2, as *E. Brandegei*.) Palmae. S. "Tallest-growing of all fan-leaved palms and most ornamental." See *Gfl.* 1903, 11. Lower California. (Southern California Acclimatizing Association.)

***Erythea elegans.** (*S. C. A. A. Cat.* 1908, 2.) S. Dwarfest of the known species of the genus. Leaves thin, with a blue tinge. Peduncles feathery. Fruits yellowish, covered with a waxy coat. Mexico. (Southern California Acclimatizing Association.)

Eucalyptus leucoxylon purpurea. (*R. H.* 1909, 216.) Myrtaceae. G. Differs from the type in having bright purple flowers. See *R. H.* 1901, 500. (Villa Valetta, Cannes.)

***Euonymus macropterus.** (*I. S. H. T.* vi. t. 233.) Celastraceae. H. Branches glabrous. Leaves petiolate, oblong or obovate, acute, cuneate at the base, serrulate. Inflorescences axillary, many-flowered; peduncle elongated, slender. Flowers whitish. Sepals 4. Petals 4, ovate. Fruit with 4 ascending wings longer than the cells. Amur Region. (L. van den Bossche, Tirlemont, Belgium.)

***Euphorbia Ledienii.** (*B. M.* t. 8275.) Euphorbiaceae. S. A succulent branched shrub, 3 ft. high or more, soon leafless, glabrous. Branches sharply 5-7-angled, 1½–3 in. thick; grooves between the angles rounded-concave. Spines in pairs, divergent, 2–4 lin. long, the pairs ⅓–¾ in. apart. Cymes each bearing 3 involucres, usually several in each axil, on stalks about 1 lin. long. Involucres 1½–2 lin. long, truncate, glabrous, yellow; lobes fimbriately toothed. This species has long been in cultivation without a name or under the erroneous name of *E. virosa*. S. Africa. (Kew.)

Euphorbia Sapinii. (*G. C.* 1909, xlv. 66, f. 37.) S. Resembles *E. bupleurifolia*. Stem thick, fleshy, covered, especially on the youngest part, with swollen mammillate tubercles; tubercles green when young, each with a hard stipular spine which falls off in about the third year. Leaves in an apical tuft, fleshy, 9–12 in. long, ½–¾ in. broad, broadest in the upper part, keeled. Flowers very small, on very short axillary peduncles. Congo. (Brussels B. G.)

***Exochorda Giraldii.** (*M. D. G.* 1908, 136, 191, 219; 1909, 295, f; *Hesse Cat.* 1909–10, 113, f.) Rosaceae. H. Young shoots bright rose. Leaves rounded or obovate, rose-red at the tips, and on the nerves and petioles. Racemes terminal, rather erect, long, lax, 6–8-flowered. Flower-buds rose

or cherry-red. Expanded flowers, white, 2½ in. across. N. China. (H. A. Hesse, Weener, Hanover.)

*Exochorda macrantha. (*M. D. G.* 1908, 191.) H. A garden hybrid between *E. grandiflora* and *E. Alberti*. (C. F. Niemetz, Temesvár, Hungary.)

*Exostemma subcordatum. (*B. M.* t. 8274.) Rubiaceae. S. Shrub 3–10 ft. high, with slender terete branches. Leaves ovate or ovate-lanceolate, 2–3 in. long, 1–1½ in. broad, acuminate, subcordate at the base; petioles very short. Inflorescence terminal, leafy, subcorymbose. Corolla white, fragrant; tube narrowly cylindric, ½–¾ in. long; lobes linear, about 1 in. long, 1 lin. broad. Stamens long-exserted. West Indies. (Kew.)

*Fothergilla monticola. (*M. D. G.* 1909, 295; *Hesse Cat.* 1909–10, 116, as *F. montana*.) Hamamelidaceae. H. Described as differing from *F. major* in having a more pendulous habit of growth and larger leaves. Shoots red-brown, tomentose. Leaves round-oval, up to 5 in. long and broad, acuminate, coarsely crenate, shining dark green above, light green beneath, not hoary. N. America. (H. A. Hesse, Weener, Hanover.) [*F. major*, Lodd.]

*Gentiana corymbifera. (*G. C.* 1909, xlvi. 203, f. 86.) Gentianaceae. H. H. Stems 12–18 in. high, usually simple below. Leaves mostly in a basal tuft, strap-shaped, about 4 in. long. Flowers white, ¾–1½ in. across, in a terminal corymb or panicle. New Zealand. (Kew.)

*Gentiana Freyniana. (*G. C.* 1909, xlvi. 203, f. 85; *K. B.* 1909, 343.) H. Similar to *G. septemfida* from which it chiefly differs in having much larger flowers, which are more inflated towards the mouth, and have a less prominent fringed crest between the larger segments of the corolla. Asia Minor. (Kew.)

Gentiana Veitchiorum. (*G. C.* 1909, xlvi. 178, f. 74; *Gard.* 1909, 479, 483, f.) H. A new species in cultivation under the erroneous name of *G. ornata*. It differs from the true *G. ornata*, Wallich, in being a more robust plant, with relatively broad obtuse leaves, and larger flowers, with broader corolla-lobes having very broad toothed folds between them. Flowers intense blue, with light longitudinal bands on the outside. W. China. (J. Veitch & Sons.) [Syn. *G. ornata*; G. C. 1909, xlvi. 173; G. M. 1909, 706, not of Wallich.]

*Geranium Fremontii. (*G. C.* 1909, xlvi. 212.) Geraniaceae. H. Stems 1–1½ ft. high. Leaves soft, light green above, paler beneath, prettily veined. Flowers purple-lilac, dark-veined, about 1¼ in. across. N. America. (S. Arnott.)

Habenaria Regnieri. (*R. H.* 1909, 518.) Orchidaceae. S. A garden hybrid between *H. militaris* and *H. carnea*. (A. Régnier, Fontenay-sous-Bois, Seine, France.)

Habranthus rutilus atroroseus. (*Gfl.* 1909, 310.) Amaryllidaceae. G. Scape robust, about 8 in. high, bearing about 9 deep rose-carmine flowers which open in succession. (M. Herb, Naples.) [*Hippeastrum*.]

Haemanthus Lambeauianus. (*R. H. B.* 1909, 96.) Amaryllidaceae. S. A garden hybrid between *H. Helleputteanus* and *H. amabilis*. (F. Lambeau, Brussels.)

Heliopsis scabra gratissima. (*Lemoine Cat.* 1909, n. 173, iv.) Compositae. H. Plant about 3 ft. high. Flower-heads very large, with 4 or 5 series of very broad reflexed and convex ligulate florets of a brilliant pale yellow colour. (V. Lemoine & Son, Nancy.)

Heliopsis scabra imbricata. (*Lemoine Cat.* 1909, n. 173, iv.) H. Plant less tall. Flower-heads 3½ in. across, very double; ligulate florets rounded, imbricate, golden-yellow. (V. Lemoine & Son, Nancy.)

Heliopsis scabra zinniaeflora. (*Lemoine Cat.* 1909, n. 173, iv.) H. Plant not exceeding 2 ft. high. Flower-heads 3–3½ in. across, almost quite double; ligulate florets reflexed, imbricate, golden-yellow. (V. Lemoine & Son, Nancy.)

Hemerocallis luteola major. (*R. H.* 1909, 60, col. t.) Liliaceae. H. A garden hybrid between *H. aurantiaca major* and *H. Thunbergii*. (V. Lemoine & Son, Nancy.)

Hemerocallis luteola pallens. (*R. H.* 1909, 60, col. t.) H. A garden hybrid between *H. citrina* and *H. Thunbergii*. (V. Lemoine & Son, Nancy.)

*Herbertia platensis. (*S. C. A. A. Cat.* 1908, 38.) Iridaceae. G. Leaves sword-shaped, light bluish-green. Flowers in tall spikes, a beautiful porcelain blue, produced during 8

months of the year. Uruguay. (Southern California Acclimatizing Association.)

Hormidium pseudopygmaeum. (*O. R.* 1909, 134.) Orchidaceae. S. Allied to *H. uniflorum* (*B. M.* t. 3233), but differs in having longer pseudobulbs, which are cylindric at the summit, rather larger leaves, and in having the flowers in a short spike. Flowers white, with a few red marks on the lip. Costa Rica. (W. Barbey, Pierrière, Geneva; Glasnevin B. G.)

***Humea elegans gigantea.** (*G. C.* 1909, xlvi. 50.) Compositae. G. Much taller than the type, attaining a height of 20 ft., with larger leaves and panicles. (Kew.)

Hydrangea cinerea forma **sterilis.** (*M. D. G.* 1908, 157.) Saxifragaceae. H. A form in which almost all the flowers are enlarged and sterile. Probably Ohio, U.S.A. (E. Y. Teas, Centerville, Indiana, U.S.A.)

***Hydrangea hortensis alba.** (*G. C.* 1909, xlv. 301; *G. M.* 1909, 371.) H. H. A pure white variety. (H. Low & Co.)

***Ilex crenata** forma **microphylla.** (*M. D. G.* 1908, 160.) Aquifoliaceae. H. Leaves only 4–6 lin. long and 1½–3 lin. broad, elliptic or narrowly elliptic, mucronate-acute, crenate-serrulate. Fruits 3–3½ lin. across. Japan. (Arnold Arboretum.)

***Ilex Sieboldii.** (*M. D. G.* 1908, 137.) H. An attractive shrub, with small oval serrulate leaves and coral-red fruits scarcely so large as a pea. There is a form with yellow fruits (*fructu luteo*) and another with white fruits (*leucocarpa* or *fructu albo*). Japan. (H. A. Hesse, Weener, Hanover.)

***Incarvillea grandiflora** var. **brevipes.** (*K. B.* 1909, 263.) Bignoniaceae. G. or H. H. Differs from the type in having the pedicels much shorter than the peduncle. S. W. China. (Bees, Ltd.) [Syn. *I. Bonvalotii*; G. C. 1909, xlv. 332, not of Bureau & Franchet.]

***Iris himalaica.** (*G. C.* 1909, xlv. 3, 36; xlvi. 15.) Iridaceae. H. Rhizome slender. Sheaths splitting into long fibres. Leaves linear, 2–3 ft. long, ¾ in. broad, drooping when full grown. Scape slender, 2 ft. high, bearing 3 heads of flowers. Spathes 2-flowered. Pedicels 3 in. long. Perianth-tube triangular, ½ in. long; standards spreading, lanceolate, with deeply channelled limb, 1½ in. long, ¾ in. broad, violet-blue, veined with a deeper shade; falls 2 in. long, 1 in. broad, obovate-cuneate, violet-blue, blotched with white and yellow at the throat. Himalaya. (W. R. Dykes.) [*I. Clarkii*, Baker.]

Iris reticulata atropurpurea. (*G. C.* 1909, xlv. 113.) H. Spathes veined and blotched with red-purple. Standards small, narrow, blackish-red. Falls with a uniform velvety black blade; haft furnished with a row of glistening black spines about $\frac{1}{16}$ in. high. Asia Minor. (W. R. Dykes.)

Juglans Allardiana. (*B. S. D. F.* 1909, 33, 34, ff.) Juglandaceae. H. Closely allied to *J. Sieboldiana* with which it has been confused. It differs chiefly in the nuts, which are blackish or ash-grey, and have usually only 4 less developed cavities. Japan. (G. Allard, Angers, France, etc.)

Juglans australis. (*B. S. D. F.* 1909, 169, 181, 212, ff.) H? Leaves very long; leaflets in 6–15 pairs, sessile, oval, about 7 in. long, rather abruptly acuminate, serrate, viscid, pubescent. Fruits small, ovoid, pubescent. Nuts small, ovoid, more or less acute, dull ash-grey, somewhat deeply striate; cavities 4–6, elongated; dissepiments not reaching to the middle. Argentina. (L. A. Dode, Paris, etc.)

Juglans cathayensis. (*B. S. D. F.* 1909, 44, 47, 169, ff.) H. Distinguished from *J. stenocarpa* by the usually blackish nuts which have more numerous and larger cavities. China. (M. L. de Vilmorin, Les Barres, France.)

Juglans coarctata. (*B. S. D. F.* 1909, 36, 38, 169, ff.) H. Leaves up to about 3 ft. long; leaflets in 4–8 pairs, 8 in. long, very acuminate, the sides somewhat parallel, slightly toothed, villous. Fruits ovate, villous, in long pendulous spikes. Nuts irregularly ovate, constricted about the middle, acute, winged at the summit only; dissepiments reaching to or exceeding the middle. Japan. (Arboretum Segrezianum, Seine & Oise, France.)

Juglans collapsa. (*B. S. D. F.* 1909, 45, 49, ff.) H. Differs from *J. Draconis* in the nuts, which are longer, subcylindric, less rugose, obscurely ribbed, less acuminate, and are furnished with ovate depressions. This species is figured in *G. C.* 1888, iv. 384, f. 53, under the erroneous name of *J. mandshurica*. N. China.

Juglans Draconis. (*B. S. D. F.* 1909, 45, 49, ff.) H? Leaves and flowers scarcely different from those of *J. stenocarpa*. Fruits up to 2½ in. long, ovate-obovate, villous. Nuts globose-obovate, 8-ribbed, often strongly rugose, ash-grey, shortly acuminate; cavities 4; dissepiments exceeding the middle. S.W. China. (L. Späth, Berlin, etc.)

Juglans Lavallei. (*B. S. D. F.* 1909, 37, 38, 169, ff.) H. Similar in leaves and flowers to *J. coarctata*. Fruits subglobose-ovate, villous, 20 or more in long pendulous spikes. Nuts subglobose, somewhat compressed, ash-grey, somewhat winged at the apex, shortly acuminate; cavities 4; dissepiments not reaching to the middle. Japan. (Arboretum Segrezianum, Seine & Oise, France; Paris B. G., etc.)

Juglans ovoidea. (*B. S. D. F.* 1909, 174, 186, ff.) H. Very near *J. nigra* or perhaps a variety of *J. malosma*. Fruits ovate, 2½–3 in. long. Nuts ovate or oblong, usually moderately rugose, subcompressed. S. W. United States.

Juglans regia var. **corcyrensis.** (*M. D. G.* 1908, 153, 219.) H. Described as a very distinct and highly decorative variety. Corfu. (C. Sprenger, Naples.)

Juglans subcordiformis. (*B. S. D. F.* 1909, 39, 43, ff.) H. Closely allied to *J. cordiformis*. Fruits more or less compressed, villous. Nuts shortly cordate, compressed, ash-grey, somewhat strongly winged, shortly acuminate; cavities 4, narrow; dissepiments reaching to the middle. Japan. (G. Allard, Angers, France.)

Juglans Torreyi. (*B. S. D. F.* 1909, 169, 175, 194, ff.) H. Leaves with 5–10 pairs of narrow somewhat remotely serrate pubescent leaflets. Fruits subglobose, 1½–2 in. long, somewhat villous. Nuts more or less depressed, compressed, rather deeply striate; cavities 4, long; dissepiments reaching to the middle. This species has been confused with *J. rupestris*. S. United States. (G. Allard, Angers, France.)

Jussieua Sprengerii. (*B. T. O.* 1909, 263.) Onagraceae. H. H. An evergreen perennial prostrate herb, somewhat softly hairy, much branched. Stem cylindric and winged. Leaves opposite, crowded, oval, acute. Flowers very large, canary-yellow. Argentina. (C. Sprenger, Naples.)

Laelia Danielsi. (*R. H.* 1909, 518.) Orchidaceae. S. A garden hybrid between *L. Perrinii* and *L. Schilleriana*. (Ch. Béranek, Paris.)

Laelia gattonensis. (*G. C.* 1909, xlvi. 61.) S. A garden hybrid between *L. anceps Dawsonii* and *L. cinnabrosa*. (Sir J. Colman.)

Laelio-cattlya Dayana. (*O. R.* 1909, 315.) Orchidaceae. G. A garden hybrid between *Cattleya velutina* and *Laelia crispa*. (H. S. Goodson.)

Laelio-cattleya wintonensis. (*O. R.* 1909, 374.) G. A garden hybrid between *Cattleya Harrisoniana* and *Laelio-cattleya Mylamiana*. (J. S. Moss.)

Larix leptolepis prostrata. (*M. D. G.* 1909, 252, 327.) Coniferae. H. A prostrate form. (F. Kneiff, Nordhausen, Germany.)

Laurelia serrata. (*B. M.* t. 8279.) Monimiaceae. H. or H. H. Tree reaching a height of 70 ft., with foetid wood. Leaves opposite, broadly oblong-lanceolate or lanceolate, 2–5-in. long, ¾–1¾ in. broad, serrate, aromatic, leathery; petiole 2-4 lin. long. Inflorescences axillary, 3–9-flowered; pedicels 1–2 lin. long. Flowers all male or the terminal only male and the rest hermaphrodite or some of them female. Perianth-segments 8, oblong-elliptic, greenish-yellow, about 1½ lin. long. Native name: Huanhuan. Chile. (This has long been cultivated at Kilmacurragh, Wicklow, under the erroneous name of *L. aromatica*. See *G. C.* 1904, xxxvi. 401, f. 172.)

Leptodermis oblonga. (*M. D. G.* 1909, 288.) Rubiaceae. H. A small shrub with slender branches. Leaves oblong, about ¾ in. long, glabrous. Flowers dark violet, tubular, about ⅔ in. long, in small terminal clusters. N. China. (Arnold Arboretum.)

Leucanthemum vomerense. (*J.S.H.F.* 1909, 432.) Compositae. H. Plant about 4 ft. high, very floriferous. Flower-heads very large, the white ray-florets being 2–2½ in. long. (Vilmorin-Andrieux & Co., Paris.)

Linaria globosa. (*G. M.* 1909, 988.) Scrophulariaceae. H. The plant forms close rounded masses of pretty glaucous green leaves and produces numerous very small lilac flowers. Country not stated. (S. Arnott.) [Probably a garden form of some common species.]

Liparis Caillei. (*B. S. B. F.* 1909, 97, t. 1, ff. 1–13.) Orchidaceae. S. A dwarf tufted epiphytic herb. Pseudobulbs ovate, flattened, 6–8 lin. long, 2-leaved at the apex. Leaves membranous, ovate, 8 lin. long, 2½ lin. broad, 5-nerved. Scape 4-winged. Raceme 7–9 in. long, several-flowered. Flowers 7 lin. broad, the lower 2 or 3 abortive. The species is characterized by the short membranous not plicate leaves, and the length of the 4-winged scape. French Guinea. (Paris B. G.)

Listrostachys dactyloceras. (*R. H.* 1909, 142.) Orchidaceae. S. A small plant only about 3 in. high. Stems stout, 3- or 4-leaved. Leaves sword-shaped, very fleshy, 1½ in. long. Racemes capitate. Flowers white. Sepals and petals 1½–1¾ lin. long. Lip 2½ lin. long. Spur about 1⅓ in. long. See *Dyer, Fl. Trop. Afr.* vii. 168. W. Trop. Africa. (Paris B. G.)

***Livistona Mariae.** (*S. C. A. A. Cat.* 1908, 3.) Palmae. S. Leaves similar in shape to those of *L. australis*, the blade and petiole when young being coloured a beautiful copper-red. See *G. C.* 1887, i. 676, 734. Central S. Australia. (Southern California Acclimatizing Association.)

Lomaria costaricensis. (*Lemoine Cat.* 1909, n. 173, 3.) Filices. G. Stem thick, short, covered as well as the bases of the stalks of the fronds with long bronze-coloured silky hairs. Fronds arched, 24–28 in. long; pinnae alternate, acuminate, undulate, coriaceous, clear green. Mountains of Costa Rica. (V. Lemoine & Son, Nancy.)

***Lomatia obliqua.** (*G. C.* 1909, xlv. 162.) Proteaceae. H. or H. H. A shrub or tree, with erect densely leafy branches. Leaves ovate, up to 4 in. long and 2½ in. broad, sometimes only about 1 in. long and ¾ in. broad, leathery, smooth, bright green, crenate; petioles brown. Flowers about ⅓ in. long, in axillary racemes shorter than the leaves, white, covered with ferruginous hairs. Chili. (Kew.)

Lonicera amoena var. **Arnoldiana.** (*M. D. G.* 1908, 163.) Caprifoliaceae. H. Differs from the type in having smaller and narrower acute leaves cuneate at the base. *L. amoena* is a garden hybrid between *L. Korolkowii* var. *floribunda* and *L. tatarica*. The variety is a hybrid between typical *L. Korolkowii* and *L. tatarica*. (Arnold Arboretum.)

Lonicera arizonica. (*Sargent, T. & S.* i. 45, t. 23; *Späth Cat.* 1909–10, 98.) H. A low bushy or sarmentose shrub. Leaves ovate or sometimes oval, ¾–2 in. long, obtuse, truncate or broadly cuneate at the base, bright green above, glaucous beneath, ciliate; petiole ¼–½ in. long. Flowers in terminal pedunculate 1–3-whorled heads. Corolla narrowly tubular-funnel-shaped, 1½–2 in. long, yellow, more or less tinged with scarlet outside; limb short, 5-lobed. Mountains of Arizona. (L. Späth, Berlin.)

Lonicera Ferdinandii Beissneriana. (*M. D. G.* 1908, 189.) H. A form in which the leaves of the radical shoots are up to 8 in. long and 2 in. broad below the middle, ovate or slightly cordate at the base, narrowed above, sharply acute; leaves of the flowering-branches scarcely half so large. Ripe fruits breaking through the involucre, red, succulent. Shensi, China. (L. Beissner, Bonn, Germany.)

Lycaste formosa. (*G. C.* 1909, xlvi. 99.) Orchidaceae. G. A hybrid of unrecorded parentage. Flowers large, cream-white, with red spots at the base of the petals. (F. Sander & Sons.)

Lycaste Skinneri var. **hellemmensis.** (*J. S. H. F.* 1909, 179; *R. H. B.* 1909, 53, col. t.) G. Flowers nearly 6 in. across. Sepals and petals bright rose-purple, darker towards the base. Lip blackish-purple at the base, yellowish-white with large purple dots towards the apex of the lobes. (O. Fanyau, Hellemmes-Lille, France; Th. Pauwels, Meirelbeke, Belgium.)

Mahonia Aquifolium. (*M. D. G.* 1908, 216, 219.) Berberidaceae. H. The following forms having variously coloured leaves are described: *albo-variegata*, *amabilis*, *aucubifolia*, *aureo-variegata* and *lutescens*. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.) [*Berberis.*]

Malus floribunda var. **Arnoldiana.** (*R. H.* 1909, 51.) Rosaceae. H. Flowers pale rose, much larger than those of the type. Fruits also much larger. (Arnold Arboretum.) [*Pyrus.*]

Mammillaria ceratites. (*M. K.* 1909, 155, f.) Cactaceae. G. Stem simple, ovoid, about 2½ in. high and 2 in. thick, greyish-green. Tubercles subrhomboid, very oblique, later corky and imbricate, woolly in the axils. Areolae circular, scarcely ¼ inch across, sparingly clothed with white wool which soon disappears. Radial spines usually 15, up to 7½ lin. long, subulate, straight,

white; central 5 or 6, up to 1¼ in. long, stouter, black above. Flowers carmine. Mexico. (F. De Laet, Contich, Belgium.)

Mammillaria crucigera. (*M. K.* 1909, 190.) G. Stem cylindric or ovoid, 6 in. high or more. Tubercles conical, 2–3 lin. long, fresh green, with abundant white wool in their axils, and at their summit 4 small yellowish spines arranged crosswise, with a small tuft of white bristles about as long. Flowers a beautiful purple. Perianth-segments lanceolate, acute. Style 5-lobed. Re-introduced. In cultivation in 1832. Mexico. (Haage & Schmidt, Erfurt, Germany.)

***Mammillaria lasiandra denudata.** (*M. K.* 1909, 79, 174.) G. Growths in groups of several heads. Stem mushroom-shaped, the older part woody and forming a round stalk. Tubercles grass-green, cylindric at first, later broadened at the base, 4 in. long, ½ in. thick; axils naked. Areolae circular, furnished with a little quickly disappearing wool. Radial spines up to 40, up to 2½ lin. long; central none. Flowers 7½ lin. long. Outer perianth-segments 5 or 6, green, acute; inner about 16, spathulate, white, with a red median stripe. Mexico. (Haage & Schmidt, Erfurt, Germany.)

Mammillaria pseudoperbella. (*M. K.* 1909, 188, f.) G. Plant forked, the divisions at first nearly globose, later more cylindric, depressed at the summit which is clothed with snow-white wool and protected by spines. Tubercles cylindric, about ¼ in. long, obliquely truncate. Radial spines 20–30, bristle-like, very short; central 2, up to nearly ¼ in. long. Flowers apparently solitary. Fruits small, deep red. Mexico. (L. Quehl, Halle-on-the-Saale, Germany.)

Mammillaria strobiliformis var. **caespititia.** (*M. K.* 1909, 173.) G. Differs chiefly from the typical form in its tufted habit of growth. (Haage & Schmidt, Erfurt, Germany.)

***Megaclinium purpureorachis.** (*G. C.* 1909, xlv. 293, f. 126; *O. R.* 1909, 155; *B. M.* t. 8273.) Orchidaceae. S. Pseudobulbs elliptic-oblong, 2½–3 in. long, 2-leaved. Leaves oblong or elliptic-oblong, 8–12 in. long, 1½–2 in. broad. Inflorescence very stout, more than 1 ft. high. Rhachis much dilated, undulate, about 7 in. long, 1½ in. broad, light yellowish-green, heavily blotched with dark red-purple. Flowers about ½ in. apart on each side of the rhachis, very hairy, dark brown, concealed in the bud-stage by curiously formed bracts, which become reflexed as the flowers successively approach maturity. Congo. (Sir Trevor Lawrence.)

Menziesia pentandra. (*M. D. G.* 1909, 287.) Ericaceae. H. A slender shrub about 3 ft. high, with elliptic-lanceolate hairy leaves 1–1¾ in. long, and urn-shaped greenish-white pendulous flowers about ⅓ in. long. Japan. (Arnold Arboretum.)

Micholitzia obcordata. (*K. B.* 1909, 358.) Asclepiadaceae. S. The genus is new and is related to *Marsdenia*. *M. cordata*, the only species known, is of no horticultural value. It is a small undershrub with milky juice, obcordate or obovate leaves up to 1⅓ in. long, and a corolla about ¼ in. long, with olive-green tube and reddish lobes. India. (Glasnevin B. G.)

Miltonia vexillaria stellata. (*R. H. B.* 1909, 190.) Orchidaceae. S. Flowers striped with rose. (F. Lambeau, Brussels.)

Miltonioda Harwoodii. (*G. C.* 1909, xlvi. 27; *O. R.* 1909, 233, f. 18; *J. of H.* 1909, lix. 51, f.) Orchidaceae. G. A garden hybrid between *Miltonia vexillaria* and *Cochlioda Noetzliana*. (Charlesworth & Co.)

Miltonioda Lindeni. (*O. R.* 1909, 57.) G. A garden hybrid of which the parents are probably *Cochlioda vulcanica* and *Miltonia Phalaenopsis*. (L. Linden, Brussels.)

Miltoniopsis Pauwelsiana. (*R. H. B.* 1909, 60; *G. C.* 1909, xlv. 142.) Orchidaceae. S. A garden hybrid between *Miltonia Roezlii* and *M. vexillaria Leopoldii*. (Th. Pauwels, Meirelbeke, Belgium.) [*Miltonia.*]

Monomeria barbata. (*G. C.* 1909, xlvi. 405.) Orchidaceae. G. Similar in growth to a *Bulbophyllum*. Scape stout, about 1 ft. long, green, spotted with purple. Flowers about 1¼ in. long, greenish, marked with red-brown. Upper sepal ovate-acuminate, resting on the column; lateral sepals longer and broader, hairy, curiously folded over each other at the tips which are greenish-white. Petals small, fringed. Lip hinged on the upturned end of the column. Sikkim Himalaya. (Glasnevin B. G.)

***Mormodes revolutum.** (*K. B.* 1909. 367.) Orchidaceae. S. Near *M. speciosa*. Pseudobulbs fusiform-ob-

long, 4½–5½ in. long. Leaves elongate-lanceolate, 6–12 in. long, 1¼–1½ in. broad, 3–5-nerved. Scapes axillary, about 4 in. long, 4–6-flowered. Sepals and petals oblong-lanceolate, 1½ in. long, deep buff-yellow. Lip oblong, 1½ in. long, reddish-brown, acute and reflexed at the apex. Peru. (F. Sander & Sons, Kew.)

Mussaenda Sanderiana. (*G. C.* 1909, xlvi. 34.) Rubiaceae. S. A compact-growing shrub 5–6 ft. high, or prostrate with branches 10–15 ft. long, silky-tomentose. Leaves subsessile, lanceolate, 3½ in. long, 1 in. broad, acuminate, cordate at the base, densely tomentose on both sides. Flowers sessile, yellow, silky, in terminal cymes. Petaloid sepal white, ovate, 3½ in. long, 1½ in. broad, on a stalk 1 in. long. Corolla 1 in. long. Indo-China. (Singapore B. G.)

***Mussaenda Treutleri.** (*B. M.* t. 8254.) S. The correct name for the plant introduced about 1840 and figured in *Bot. Reg.* xxxii. t. 24, as *M. macrophylla*, Wall. from the type of which it differs in having a more scattered rougher pubescence, larger leaves, broader stipules, more herbaceous sepals, etc. India. (Kew.)

***Nemesia lilacina.** (*K. B.* 1909, 376.) Scrophulariaceae. H. H. Annual herb 8-15 in. high, profusely branched, minutely glandular-pubescent. Leaves narrowly lanceolate, ¾–1½ in. long, 2–3 lin. broad, toothed. Racemes 4–11 in. long, lax. Pedicels slender, up to ½ in. long. Corolla small; upper lip scarcely ⅛ in. long, lilac, with dark purple stripes; lower lip about ⅛ in. long, purple-lilac, with a yellow blotch on the palate; spur whitish. German S.W. Africa. (Haage & Schmidt, Erfurt, Germany.)

Nepenthes grandis. (*J. S. H. F.* 1909, 595; *R. H.* 1909, 534.) Nepentheacae. S. A garden hybrid between *N. Curtisii superba* and *N. Northiana pulchra*. See *G. C.* 1909, xlvi. 393. (R. Jarry-Desloges, Paris.)

Nepenthes remilliensis. (*J. S. H. F.* 1909, 595; *R. H.* 1909, 534; *G. C.* 1909, xlvi. 393, as *N. remillyensis*.) S. A garden hybrid between *N. Curtisii superba* and *N. Northiana pulchra*. (R. Jarry-Desloges, Paris.)

Nephrolepis exaltata var. **Marshallii.** (*G. C.* 1909, xlvi. 331; *G. M.* 1909, 905, f.) Filices. S. A sport from the variety *Amerpohlii*. It is stoloniferous, with much more finely divided more densely plumose and broader fronds than any other plumose variety of the species. (H. B. May & Sons.)

Nephrolepis lycopodioides. (*G. C.* 1909, xlv. 301; *G. M.* 1909, 363, f.) S. Fronds densely plumose and moss-like, rather small. (T. Rochford & Sons.)

Nephrolepis magnifica. (*G. C.* 1909, xlvi. 26; *G. M.* 1909, 539, 558, f.) S. A variety of *N. exaltata* resembling var. *Amerpholii*, but the fronds are more finely cut. (Stuart Low & Co.)

Nephrolepis ornata. (*R. H. B.* 1909, 222.) S. Very distinct and compact in habit. (Dervaes frères, Wetteren, Belgium.)

Nephrolepis Schoelzeli. (*R. H.* 1909, 201; *Gfl.* 1909, 198.) S. Derived from the Boston Fern, a variety of *N. exaltata*. Its fronds are very plumose. (H. A. Dreer, Philadelphia, U.S.A.; O. Bernstiel, Bornstedt, Potsdam, Germany.)

Nephrolepis splendens. (*G. C.* 1909, xlvi. 363; *G. M.* 1909, 947.) S. Plant about 2½ ft. high and the same across. Fronds 18–24 in. long, 5 in. broad, deep green, very elegant, with large overlapping pinnae. Stated to be a hybrid between *N. Bausei*, a variety of *N. pluma*, and *N. recurvata*, the name given to a chance sporeling. (H. B. May & Sons.)

***Nephrolepis superba.** (*R. H. B.* 1909, 222.) S. Fronds very undulated. (Dervaes frères, Wetteren, Belgium.)

Oberonia umbraticola. (*K. B.* 1909, 62.) Orchidaceae. S. A stemless herb, 2–2½ in. high. Leaves ensiform, 1¼–3¼ in. long, ⅓–½ in. broad. Scape slightly longer than the leaves. Spikes cylindric, densely flowered, 1¼-2 in. long. Flowers minute, orange. Siam. (Trinity Coll. B. G., Dublin.)

***Octomeria arcuata.** (*K. B.* 1909, 61.) Orchidaceae. S. A tufted herb, 3–5 in. high. Stems rather slender, clothed with membranous sheaths. Leaves subsessile, lanceolate, 2½–3¾ in. long, 5–8 lin. broad. Flowers solitary, subpendulous, scarcely ½ in. long, light yellow, with the keels and side-lobes of the lip and the column red-purple. Sepals and petals oblong. Lip 3-lobed, 3½ lin. long, recurved. Brazil. (Kew.)

Octomeria Oppenheimii. (*Orch.* 1909, 9.) S. Stem slender, about 2 in.

long, bearing 5 loose membranous sheaths, 1-leaved. Leaves ovate-lanceolate, 2½ in. long, ⅔ in. broad. Flowers small, white, somewhat nodding. Sepals lanceolate, 4½–5 lin. long, the lateral connate at the base. Petals 4½ lin. long. Lip 2½ lin. long, 1½ lin. broad. Brazil. (P. Oppenheim, Gross-Lichterfelde, Berlin.)

Odontioda chelseiensis. (*G. C.* 1909, xlv. 347, f. 153; *G. M.* 1909, 70, f.; *O. R.* 1909, 48, f. 5.) Orchidaceae. G. A garden hybrid between *Cochlioda vulcanica grandiflora* and *Odontoglossum crispum*. (W. Bull & Sons.)

Odontioda Cooksoniae. (*G. C.* 1909, xlv. 347.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum ardentissimum*. (N. C. Cookson's Exors.)

Odontioda eboriacum. (*O. R.* 1909, 154.) G. A hybrid of unknown parentage. Its flowers are of medium size, with scarlet sepals and petals, and scarlet lip with pale yellow markings. (J. H. Craven.)

Odontioda gattonensis. (*G. C.* 1909, xlv. 17.) G. A garden hybrid between *Odontoglossum Kegeljanii* and *Cochlioda Noetzliana*. (Sir J. Colman.)

Odontioda Goodsoniae. (*G. C.* 1909, xlv. 174, 194, f. 83.) G. A garden hybrid probably between *Cochlioda Noetzliana* and *Odontoglossum ardentissimum album*. (H. S. Goodson.)

Odontioda Graireana. (*O. R.* 1909, 315; *G. C.* 1909, xlvi. 174, as *O. Grairiana*.) G. A garden hybrid between *Odontoglossum Rossii majus* and *Cochlioda Noetzliana*. (H. Graire, Amiens, France.)

Odontioda Hyeanae. (*T. H.* 1909, 270.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum ardentissimum*. (J. Hye.)

Odontioda Lambeauiana. (*T. H.* 1909, 332.) G. A garden hybrid between *Odontoglossum Lambeauianum* and *Cochlioda Noetzliana*. (F. Lambeau, Brussels.)

Odontioda Lutetia. (*G. C.* 1909, xlv. 141.) G. A garden hybrid between *Odontoglossum luteopurpureum* and *Cochlioda Noetzliana*. (Charlesworth & Co.)

Odontoglossum Armstrongiae. (*G. C.* 1909, xlv. 347.) Orchidaceae. G. A garden hybrid of unrecorded parentage. (Armstrong & Brown.)

Odontoglossum Arnoldii. (*G. C.* 1909, xlv. 239.) G. A garden hybrid of unrecorded parentage. (J. G. Fowler.)

Odontoglossum crispum maximum. (*R. H. B.* 1909, 190.) G. Flowers very large and finely shaped. (F. Lambeau, Brussels.)

Odontoglossum distans. (*O. R.* 1909, 334.) G. Resembles *Oncidium macranthum* in habit, but it has an erect loosely-branched panicle. Flowers ¾ in. across, with narrow light greenish-yellow sepals and petals, and a tinge of rose on the lip. Venezuela and Colombia. (Stuart Low & Co.)

Odontoglossum Goodsonii. (*G. C.* 1909, xlvi. 136; *J. of H.* 1909, lix. 243, f.; *O. R.* 1909, 280.) G. A garden hybrid between *O. Uroskinneri* and *O. Pescatorei Charlesworthii*. (H. S. Goodson.)

Odontoglossum moortebeekiense. (*O. R.* 1909, 315.) G. A garden hybrid between *O. Edwardii* and *O. cirrhosum*. (L. Linden, Brussels.) [*O. Fletcherianum*.]

Odontoglossum Pauwelsii. (*O. R.* 1909, 68.) G. A natural hybrid apparently between *O. Pescatorei* and *O. blandum*. Colombia. (Th. Pauwels, Meirelbeke, Ghent.)

Odontoglossum Stamfordianum. (*G. C.* 1909, xlvi. 237.) G. A garden hybrid between *O. bictoniense album* and *O. Uroskinneri*. (H. T. Pitt.)

Odontoglossum tripudians × Pescatorei Charlesworthii. (*Orch.* 1909, 10, f. 1.) G. A garden hybrid. (O. N. Witt, Berlin.)

Odontoglossum Wyonianum. (*G. C.* 1909, xlv. 174, 210, f. 89; *G. M.* 1909, 220.) G. A garden hybrid of unrecorded parentage. (J. G. Fowler.)

***Olearia myrsinoides** var. **erubescens.** (*G. C.* 1909, xlv. 213.) Compositae. H. or H. H. More vigorous than the type and more densely tomentose. Leaves larger, often 3 in. long. Flower-heads slightly larger, often tinged with light purple-red; ligulate florets fewer. E. Australia & Tasmania. (Kew.)

Oligobotrya Henryi. (*B. M.* t. 8238.) Liliaceae. H. A herb with a slender flexuous erect stem over 3 ft. high. Leaves sessile or shortly stalked, ovate-oblong or ovate, 4 in. long, 1½–2 in. broad. Racemes terminal, elongated,

simple or branching. Perianth white or pale yellow; tube cylindric, ¼ in. long, ⅛ in. broad; lobes small, spreading, oblong-ovate. The genus is intermediate between *Smilacina* and *Polygonatum*. Central China. (J. Veitch & Sons.)

Oligobotrya Henryi var. **violacea.** (*B. M.* t. 8238.) H. Differs from the type in having the perianth-tube violet outside, with the lobes paler. Central China. (J. Veitch & Sons.)

Oncidium abortivum. (*G. C.* 1909, xlvi. 322, f. 141.) Orchidaceae. G. Remarkable in having the greater number of the flowers abortive. Perfect flowers scattered amongst the abortive ones in a slender panicle, pale yellow with chestnut-brown markings. Venezuela. (Sir F. Crisp.)

Oncidium anfractum. (*K. B.* 1909, 367.) Near *O. Reichenbachii* with which it has been confused. Pseudobulbs oblong, compressed, about 2 in. long, 1–1¼ in. thick. Leaves oblong or linear-oblong, 5–9 in. long, ¾–1¼ in. broad. Scapes rather slender, flexuose, paniculate, about 3 ft. long; branches short, sharply bent back. Flowers bright yellow, with dark brown bars on the sepals and petals and lighter brown blotches on the basal half of the lip. Sepals lanceolate, 5 lin. long. Petals similar but broader. Lip broadly fiddle-shaped, 7½ lin. long. Venezuela. (H. Low & Co.)

Oncidium Charlesworthii. (*G. C.* 1909, xlv. 348, 376, f. 166; *G. M.* 1909, 436, 439, f.) G. Probably a natural hybrid of *O. crispum*. Flowers large, with deep chestnut-brown sepals and petals marked with slight wavy transverse lines. Lip bright yellow at the base, blotched with brown in front, suggesting *O. Marshallianum*. (Charlesworth & Co.)

Oncidium hybridum. (*G. C.* 1909, xlvi. 439; *J. of H.* 1909, lix. 614.) G. A garden hybrid between *O. tigrinum* and *O. lamelligerum*. (Charlesworth & Co.)

***Onopordon Salteri.** (*GH.* 1909, 434.) Compositae. H. Plant pyramidal in habit, about 5 ft. high, silvery shining. Lowest leaves widely spreading on the ground, incised, spiny; upper reduced. Flower-heads not described. Country not stated. (Versuchsfelde, Brandenburg, Germany.)

Opuntia santa-rita. (*S. M. C.* lii. 195, t. 15.) Cactaceae. H.? A very attractive species with reddish usually orbicular joints. Areolae with chestnut-brown bristles. Spines usually wanting, sometimes 1 or 2, ¾–1¾ in. long. Flowers very handsome, deep yellow, 2¼–3 in. across. S.W. United States. (New York B. G., etc.) [Syn. *O. chlorotica santa-rita*, Griff. & Hare.]

Opuntia utahensis. (*M. K.* 1909, 133, f.) H. Branched, prostrate; joints ascending, elliptic or obovate, swollen, about 6 in. long, 3½ in. broad. Areolae circular, with yellowish white wool. Spines 1–4, rigid, up to 1¾ in. long, grey, brown at the apex. Flowers carmine, up to nearly 4 in. across; outer segments scale-like, fleshy, spinescent-acuminate; inner almost cordate, nearly 2 in. long, about 1¼ in. broad. Utah, U.S.A. (Darmstadt B. G.)

Oreodoxa borinquena. (*S. C. A. A. Cat.* 1908, 3.) Palmae. S. "Attains great size, with a slender ivory-white trunk and majestic crown of feathery leaves." Porto Rico. (Southern California Acclimatizing Association.)

***Ornithidium bicolor.** (*K. B.* 1909, 64.) Orchidaceae. S. Pseudobulbs tufted, ovoid, 2–3 in. long, 2-leaved at the base, 1-leaved at the apex. Leaves strap-shaped, 6–12 in. long, bowed. Flowering-stem elongate, clothed with spreading oblong leaves 3–4 in. long. Flowers axillary, subfasciculate, stalked, ⅓ in. long, bright yellow, with a crimson blotch on the front lobe of the lip. Colombia. (L. Linden & Co., Brussels; Kew.)

***Ourisia macrophylla.** (*G. C.* 1909, xlv. 390, f. 172; *Gard.* 1909, 435, f.) Scrophulariaceae. H. or H. H. Herb with a basal tuft of dark green leaves about 6 in. long. Flowering-stems several. Flowers stalked, borne in superposed whorls, white or white streaked with purple. New Zealand. (Bees, Ltd.; Edinburgh B. G.)

***Paeonia Veitchii.** (*G. C.* 1909, xlvi. f. 1; *Gard.* 1909, 539, 542, f.) Ranunculaceae H. Stem about 2 ft. high, bearing 6 or 7 leaves. Leaves light green, shining, with 15 acute segments ½ in. broad; petiole of the lowest leaf 4–8 in. long. Flowers several to each stem, on a slender stalk, often nodding, 3¾ in. across, sometimes becoming quite flat, purplish-crimson. W. China. (J. Veitch & Sons.)

Palisota Pynaertii foliis variegatis. (*R. H. B.* 1909, 378, col. t.) Commelinaceae. S. Leaves variegated. (Brussels B. G.)

Paphiopedilum insigne var. **Lagerae.** (*O. R.* 1909, 40, f. 3.) Orchidaceae. G. Dorsal sepal dark reddish-brown in the centre, suffused with greenish-yellow towards the edges, with 4 or 5 rose-purple marks at the upper part of the blotch, pure white on the margin. Petals yellowish-green, heavily barred and veined with reddish-brown. (Lager & Hurrell, Summit, New Jersey, U.S.A.)

Paphiopedilum niveum var. **Gloria Mundi.** (*O. R.* 1909, 9, f. 1.) S. Flower pure white, with a few very minute purple dots on the petals. (E. D. Bostock.)

Parthenocissus tricuspidata aurata. (*M. D. G.* 1908, 216, 219.) Ampelidaceae. H. Leaves marbled with golden-yellow and green. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Passiflora adenophylla. (*I. S. H. T.* vi. t. 236.) Passifloraceae. G. Leaves glabrous, cordate at the base, 3-lobed almost to the middle, furnished with glands in the sinus; lobes oblong, subacute, apiculate; petiole 1–1½ in. long, furnished with sessile glands. Peduncle as long as or longer than the petiole. Flowers white. Sepals with a subulate appendage on the back near the apex. Petals narrower and shorter than the sepals. It has been suggested that this species is identical with *P. alba*, Link & Otto. Mexico. (L. van den Bossche, Tirlemont, Belgium.)

***Patrinia palmata.** (*G. C.* 1909, xlvi. 244, f. 109.) Valerianaceae. A spreading plant 6–12 in. high. Leaves nearly all radical, palmate. Flowers in corymbs, numerous, fragrant, golden-yellow. Japan. (Kew.)

***Pelargonium brevipetalum.** (*K. B.* 1909, 184.) Geraniaceae. G. Stem thick and fleshy, ovoid, rising 1¾–2 in. above the soil, 1¼ in. thick, shortly branched at the apex. Leaves in a loose rosette, bipinnately divided, 3½–8 in. long, 1½–4 in. broad, ovate-oblong in outline, thick and fleshy; pinnae 5 or 6 each side, unequally pinnatisect. Peduncles erect, 10 in. long, branched above. Sepals 3½ lin. long, the dorsal erect and the rest reflexed. Petals subequal, elliptic, pale yellow, shorter than the sepals. Cape Colony. (Kew.)

***Peliosanthes violacea** var. **Clarkei.** (*B. M.* t. 8276.) Haemodoraceae. S. Herb with a short rootstock. Leaves oblong-lanceolate, up to 1 ft. long, 2½ in. broad, acuminate, glabrous; petiole 5–12 in. long. Racemes about 6 in. long. Flowers solitary, rather broadly campanulate, 5 lin. across, dark purple. The type has deep violet flowers. Assam to Malay Peninsula. (Kew.)

Periploca sepium. (*M. D. G.* 1909, 287.) Asclepiadaceae. H. A dwarf climbing shrub. Leaves oval or lanceolate, acute, often up to 4 in. long, entire, glabrous, dark green and shining above, pale green beneath. Flowers similar to those of *P. graeca*, but the corolla-lobes instead of being spread out flat are curved or rolled backwards. N. China. (Arnold Arboretum.)

Phalaenopsis gigantea. (*G. C.* 1909, xlv. 306, f. 131.) Orchidaceae. S. Similar to *P. amabilis* and *P. violacea* in habit of growth, but the leaves are much larger and thicker and are very glossy. Flowers less showy than those of *P. amabilis*, whitish, with many dark brown spots. Borneo. (Buitenzorg B. G., Java.)

***Phellodendron Lavallei.** (*B. S. B. F.* 1908, 648.) Rutaceae. H. Differs from *P. japonicum*, under which name it is in cultivation, by the fruits often being only half as large, the inflorescence less woolly pubescent, and the trunk corky. It is separated from *P. amurense* by its leaflets being much less pubescent and less lanceolate. Japan. (Arboretum Segrezianum, Seine & Oise, France.)

Philadelphus brachybotrys. (*Hesse Cat.* 1909–10, 137.) Saxifragaceae. H. A distinct species with very large white fragrant flowers. China. (H. A. Hesse, Weener, Hanover.) [This is probably *P. pekinensis* var. *brachybotrys*, included in the list of 1904. That plant, however, is described as having small flowers.]

***Philadelphus sericanthus.** (*Hesse Cat.* 1909–10, 139.) H. Leaves oblong-lanceolate, long-acuminate, few-toothed, glabrous or nearly so, or in the axils of the nerves beneath densely white-hairy. Inflorescence 7–11-flowered, lax. Calyx and ovary thickly clothed with stiff adpressed grey hairs. Style somewhat shorter than the stamens. See *Gfl.* 1896, 561, and *M. D. G.* 1904, 84. Central China. (M. L. de Vilmorin, Les Barres, France; H. A. Hesse, Weener, Hanover.)

Picea excelsa acrocoma. (*Hesse Cat.* 1909–10, 247.) Coniferae. H. Cones bearing at the apex a tuft of hard short and broad sharply pointed needles. (H. A. Hesse, Weener, Hanover.)

Picea pungens tabuliformis. (*M. D. G.* 1909, 268, 327.) H. A flat-topped form resembling *P. pungens prostrata.* (Prince M. Lobkowitz, Eisenberg, Bohemia.)

Picea Schrenkiana globosa. (*M. D. G.* 1908, 59.) H. Plant about 6 ft. high, globose in shape. (E. Schelle, Tübingen, Germany.)

Pinus Cembra compacta. (*M. D. G.* 1909, 268, 327.) Coniferae. H. Compact and conical in habit. (Prince M. Lobkowitz, Eisenberg, Bohemia.)

Pittosporum heterophyllum × Tobira. (*R. H.* 1909, 470, f. 210.) Pittosporaceae. H. H. Garden hybrid. (Marseilles B. G.)

***Pleurothallis attenuata.** (*K. B.* 1909, 364.) Orchidaceae. G. Stems very short, covered with brown sheaths. Leaves elliptic, 1–1¼ in. long, 3–5 lin. broad, rather thick, minutely 3-toothed. Scapes slender, 3–4 lin. long, 2-4-flowered. Flowers about ⅔ in. long. Sepals and petals light green, with a dull purple band at the base and a little purple marbling above. Lip greenish-white, with a shallow keel on the front bearing 10 erect papillae. Country unknown. (Glasnevin B. G.; Kew.)

***Pleurothallis Birchenallii.** (*K. B.* 1909, 365; *G. C.* 1909, xlv. 270, 391, f. 173.) G. Allied to *P. insignis.* Stems rather slender, 1¾–3¾ in. long. Leaves elliptic-oblong, 3–4 in. long, ¾–1¼ in. broad. Scapes rather slender, 5 in. long, 3–7-flowered. Sepals very long-tailed, about 2 in. long, dull reddish-purple, the dorsal margined with light green at the base. Petals very long-tailed, 1¼ in. long, light green, striped with brown at the base. Lip 3-lobed, 5 lin. long; side lobes greenish-white; front lobe dull reddish-purple. Colombia. (J. Birchenall; Charlesworth & Co.)

Polygonum cuspidatum var. **spectabile.** (*R. H. B.* 1909, 232, 245, f.) Polygonaceae. H. Leaves petiolate, rather large, broadly ovate, acuminate, truncate at the base, marbled with pale yellow, cream-white, green and carmine-red. [Included in list of 1903 as *P. spectabile.*]

Polystachya campylolgossa. (*K. B.* 1909, 366.) Orchidaceae. S. Pseudobulbs tufted, ovoid, about 1 in. long, 2–3-leaved. Leaves oblong or linear-oblong, 2–4 in. long, 4–8 lin. broad. Scapes erect, subcompressed, pubescent, about 2 in. long, 1- or few-flowered. Flowers green, with a brown stain on the foot of the column and base of the lip. Sepals 5–6 lin. long, up to 5 lin. broad. Petals 4 lin. long. Lip 3-lobed, strongly recurved, 5 lin. long. Brit. E. Africa. (F. Sander & Sons.)

Polystachya stricta. (*K. B.* 1909, 63.) S. Pseudobulbs tufted, oblong, 1¾–3¼ in. long, 2-leaved. Leaves oblong, 3–5 in. long, ⅔–¾ in. broad. Panicle erect, straight, 9 in. long; branches up to 1 in. long. Flowers ⅓ in. long, light greenish-yellow, with a few faint purple streaks on the base and side lobes of the lip. Brit. E. Africa. (Cambridge B. G.)

Populus Carriereana. (*Späth Cat.* 1909–10, 106.) Salicaceae. H. Young plants with a broadly pyramidal habit and beautiful somewhat grey-green large leaves. Country unknown. (L. Späth, Berlin.) [*P. Carreiriana*, Dode.]

Populus Comesiana. (*M. D. G.* 1908, 154.) H. A high tree, with a broad head of branches. Leaves long-stalked, roundish, cuneate at the base, greyish-green and slightly hairy above, silver-white-tomentose beneath, entire or slightly and irregularly lobed and toothed. Italy.

Populus subintegerrima. (*M. D. G.* 1908, 153.) H. A small tree, with a roundish head of branches; bark pale ash-coloured, often with black warts. Leaves long-stalked, almost cuneate, undivided or slightly lobed towards the apex, irregularly toothed, almost green above, silver-white-tomentose beneath. Spain.

***Populus vistulensis.** (*Späth Cat.* 1909–10, 107.) H. Growth moderately strong. Branches spreading, clothed with medium-sized rhomboidal dark green leaves. Europe. (L. Späth, Berlin.)

***Primula Bulleyana.** (*N. B. G. Edinb.* iv. 231, tt. 39 a, 42; *G. C.* 1909, xlv. 332; xlvi. 15, ff. 9–11.) Primulaceae. H. Leaves similar to those of the common primrose, 5–7 in. long, 1¼–1¾ in. broad; midrib red. Scape 1½–3 ft. high, farinaceous on the upper part. Flowers in 3–7 superposed whorls, fragrant. Corolla orange-buff or deep reddish-orange; tube cylindric below, funnel-shaped above; limb about ¾-in. across. S.W. China. (Bees, Ltd.; Edinburgh B. G.)

Primula cortusoides var. **lichiangensis.** (*N. B. G. Edinb.* iv. 217, t. 27; *G. C.* 1909, xlv. 332.) H.? Plant 6–14 in. high. Flowers fragrant,

rich rose-red or almost crimson, with a greenish-yellow eye. S.W. China. (Bees, Ltd.)

Primula denticulata grandiflora. (*T. H.* 1909, 101, 105, f.) H. Flowers as large again as in type, pure white to lilac or violet, rose or reddish. (G. Arends, Ronsdorf, Germany.)

***Primula Forrestii.** (*N. B. G. Edinb.* iv. 228, tt. 38, 39 b; *G. C.* 1909, xlv. 268, 274, 299, ff. 117–118, 129.) H. Plant very small or sometimes reaching a height of 9 in. Leaves petiolate, ovate-elliptic, subcordate or attenuated at the base, irregularly bicrenate, densely clothed with glandular hairs, the younger densely farinose beneath. Scape strong, erect, bearing an umbel of 10–25 flowers. Corolla deep yellow, with orange-coloured eye, fragrant as well as the leaves; tube 7 lin. long; limb about ¾ in. across. S.W. China. (Bees, Ltd.)

***Primula Littoniana.** (*N. B. G. Edinb.* iv. 225, tt. 33 b, 35, 36; *G. C.* 1909. xlvi. 15, ff. 6–8.) H. Leaves broadly lanceolate, 7–8 in. long, 1½–3 in. broad, rounded at the apex, attenuated at the base into a broadly winged petiole, irregularly dentate, greyish-green, hairy. Scape thick, erect, 1–2 ft. high, farinaceous. Inflorescence a dense spike up to 5 in. long. Bracts and calyx blood-red. Corolla violet-purple; tube about 3 lin. long, much longer than the calyx; limb concave, 3–4 lin. across. S.W. China. (Bees, Ltd.; Edinburgh B. G.) [*P. Viali*, Delavay.]

***Primula siberica chinensis.** (*Veitch Herb. P. Nov.* 1909–10, 3.) H. A perennial variety. Flowers lilac, with a white eye, larger than in the type. China. (J. Veitch & Sons.)

Pritchardia Wrightii. (*S. C. A. A. Cat.* 1908, 3.) Palmae. S. Remarkable for its barrel-shaped trunk, and very large almost rounded leaves which are more than 5 ft. across. Cuba. (Southern California Acclimatizing Association.)

Promenaea microptera. (*O. R.* 1909, 264.) Orchidaceae. G. Dwarf-growing, with elliptic-oblong pseudobulbs about ½ in. long. Leaves lanceolate, acute, 3½ in. long, about ½ in. broad. Flowers 1½ in. broad. Sepals and petals lanceolate, acute, light green. Lip 3-lobed, the basal half white, with numerous narrow purple bars, and the front lobe green, with 3 or 4 broad purple bars. Column pale green, with a purple stain at the base. Re-introduced. In cultivation in 1881. Brazil. (Stuart Low & Co.)

***Prunus paracerasus.** (*M. D. G.* 1909, 170.) Rosaceae. H. A new species intermediate between *P. serrulata* and *P. Pseudo-cerasus*. From the former it differs in having the pedicels, style, and usually the outside of the calyx, hairy, and from the latter, amongst other characters, in having the young leaves pale green, not bronze-coloured, and the calyx-lobes sharply serrate instead of nearly entire. Japan. (L. Späth, Berlin; Berlin-Dahlem B. G.)

Prunus pennsylvanica var. **saximontana.** (*M. D. G.* 1908, 160.) H. Differs from the type amongst other characters by its shrubby growth, broader and smaller pale green leaves, and few-flowered sessile umbels. N. America. (Arnold Arboretum.)

***Prunus Sargentii.** (*M. D. G.* 1908, 159; 1909, 164.) H. A new species which has been confused with *P. Pseudo-cerasus* from which it differs by having all its parts glabrous. It is nearest allied to *P. serrulata*, differing by having sessile umbels and more coarsely toothed leaves. Japan. (Arnold Arboretum.) [*P. Pseudo-cerasus*, Sargent, Gard. & For. 1897, 462, f. 58, not of Lindley.]

***Pseuderanthenum seticalyx.** (*B. M.* t. 8244.) Acanthaceae. S. An erect somewhat hirsute undershrub. Leaves petiolate, ovate, acuminate, 2–5 in. long, 1½–3½ in. broad. Inflorescence spicate, terminal or also in upper leaf-axils, at first dense, becoming 4 in. long, the slender bracts and calyx-lobes very conspicuous when young. Corolla salver-shaped; tube long, narrow, pale red; limb cinnabar-red above, paler beneath, 1 in. across. Nyasaland. (Kew.) [Syn. *Eranthemum seticalyx*, C. B. Clarke.]

Pteris aquilina congesta. (*G. C.* 1909, xlv. 205; *G. M.* 1909, 266.) Filices. H. Plant only 12–14 in. high. Fronds rich green, plumose, very compact. (H. B. May & Sons.)

Quercus aliena. (*M. D. G.* 1909, 282.) Cupuliferae. N. Without description. China; Corea; Japan. (Arnold Arboretum.)

Raphia Gentiliana. (*R. H. B.* 1909, 381.) Palmae. S. An elegant palm resembling a *Kentia* in habit, and having the pinnate leaves furnished with small prickles. Congo. (Laeken Col. G., Brussels.)

Rehmanni angulata var. **tricolor.** (*B. T. O.* 1909, 332.) Scrophulariaceae. G. Flowers at first bright purple, afterwards almost violet-rose, the upper lip shaded with vermilion, and the throat whitish, spotted with purple. Central China. (C. Sprenger, Naples.)

***Rehmannia Henryi.** (*K. B.* 1909, 262; *B. M.* t. 8302.) A perennial herb, 6–16 in. high, simple or branched at the base, glandular-pilose. Radical leaves elliptic-oblong, 3–7 in. long, 1–2½ in. broad, crenate-dentate or more or less lobed; stem leaves very similar, gradually smaller, long-stalked. Flowers axillary. Pedicels 1¼–2 in. long. Corolla-tube about 2 in. long, ¾ in. broad at the apex, dirty sulphur-yellow, minutely red-dotted; limb 2-lipped, nearly 2 in. across, white. Central China. (Kew.) [Syn. *R. Piasezkii*, Hemsl., not of Maxim.]

***Rheum Alexandrae.** (*Veitch N. H. P.* 1909, 5, f.; *R. H. B.* 1909, 297, f.) Polygonaceae. H. A distinct-looking species, with relatively small elliptic-ovate glossly dark green leaves, and flowering-stems 3–4 ft. high, conspicuous with large pale yellow leaf-like bracts. W. China; Tibet. (J. Veitch & Sons.)

Rhipsalis Novaesii. (*M. K.* 1909, 12, f.; *B. K.* t. 116.) Cactaceae. S. Plant erect, 2 ft. high, freely branched. Lower joints of the branches terete, 3–4 lin. thick, grey-green, ribbed, with areolae rather close together bearing short yellowish-white wool and 10–25 adpressed bristles about ½ in. long; upper joints in a whorl of 3–5, 5–6 in. long, not ribbed, with areolae destitute of wool. Flowers lateral, about 1¼ in. across, pale yellowish-white; segments 15 or 16, oblong. Ovary immersed. Brazil. (Berlin-Dahlem B. G.)

***Rhododendron adenopodum.** (*G. C.* 1909, xlv. 291, f. 125.) Ericaceae. H. or H. H. A bush 4–10 ft. high. Leaves oblong-lanceolate, 3–6 in. long, acute, coriaceous, smooth above, densely covered beneath with a close white tomentum. Inflorescence 4–6-flowered or more. Pedicels hairy. Corolla campanulate, pale rose, 2½–3 in. across. Pistil hairy. Central China. (M. L. de Vilmorin, Les Barres, France.)

***Rhododendron coombense.** (*B. M.* t. 8280.) H. A dwarf densely branched shrub; flowering-twigs slender, lepidote. Leaves persistent, oblong-lanceolate, 1¼–1½ in. long, apiculate, cuneate or somewhat rounded at the base, at first lepidote on both sides, finally glabrescent above, persistently lepidote beneath. Flowers in trusses of 3–5 at the ends of the branchlets. Calyx-lobes very short, rounded. Corolla broadly campanulate, pale purple, 1¼–1½ in. across. Ovary densely lepidote. China. (J. Veitch & Sons.)

Rhododendron lacteum. (*R. H.* 1909, 18.) H. Leaves large, coriaceous, densely covered beneath with a reddish tomentum. Flowers white. W. China. (Ph. L. de Vilmorin, Verrières-le-Buisson, France.)

***Rhododendron Souliei.** (*G. C.* 1909, xlv. 332, 380, f. 167 and suppl. ill.; *Gard.* 1909, 277, 278, f.) H. A bush 3–12 ft. high, sometimes flowering when only 1 ft. high; young shoots reddish. Leaves ovate-cordate, glaucous when young, afterwards reddish, finally green. Calyx glandular-ciliate. Corolla rose-pink, rather flat, 3–4 in. across; lobes 5, broad, rounded, emarginate. Ovary and style covered with sessile glands. W. China. (J. Veitch & Sons.)

Ribes amictum var. **hispidulum.** (*R. H.* 1909, 177, f. 64.) Saxifragaceae. H. Differs from the variety *pubescens* in having the shoots clothed with stiff glandular hairs, the flowers smaller, and the ovary and fruit glabrous. California. (E. de Janczewski, Cracow, Austria.)

Ribes amictum var. **pubescens.** (*R. H.* 1909, 177.) H. Distinguished from the variety *cruentum* (*R. cruentum* in the list of 1906) in being pubescent. (E. de Janczewski, Cracow, Austria.)

Ribes fuscescens. (*Späth Cat.* 1909–10, 115.) A garden hybrid between *R. bracteosum* and *R. nigrum*. (L. Späth, Berlin.)

Ribes futurum. (*Späth Cat.* 1909–10, 115.) A garden hybrid between *R. vulgare* and *R. Warszewiczii*. (L. Späth, Berlin.)

Ribes glaciale var. **minus.** (*Späth Cat.* 1909–10, 115.) H. More finely and densely branched than the type, with paler green leaves. E. Tibet. (L. Späth, Berlin.)

Ribes innominatum. (*Späth Cat.* 1909–10, 115.) H. A garden hybrid between *R. divaricatum* and *R. Grossularia*. (L. Späth, Berlin.)

Ribes Vilmorinii. (*Späth Cat.* 1909–10, 116.) H. A densely branched erect shrub about 6 ft. high, with ornamental foliage; young shoots with purple bark. Flowers greenish, in short racemes. Tibet. (L. Späth, Berlin.)

Robinia coloradensis. (*B. S. B. F.* 1908, 650.) Leguminosae. H. Differs from *R. neomexicana* by having longer and straighter shoots, leaflets somewhat larger, greener, and less numerous, flowers rose-white or rose, without any trace of lilac, fragrant, and the mature pods not echinate. Colorado. (M. L. de Vilmorin, Les Barres, France.)

***Rubus Koehneanus.** (*Späth Cat.* 1908–9, 123; *B. M.* t. 8246.) Rosaceae. H. A suberect shrub 3–4 ft. high; branches smooth or sparingly prickly, with a purplish bloom. Leaves simple, 3–5 lobed or sometimes almost entire, 1½–5 in. long, ¾–5 in. broad, usually deeply cordate at the base, green above, white-pubescent beneath; lobes acute or subacute; petioles ½–3 in. long, sparingly prickly. Flowers few, in loose terminal corymbs. Petals white, elliptic-oblong or obovate, about ⅓ in. long. Fruit globose, orange, small. Japan. (L. Späth, Berlin; Kew.) [*R. innominatus*, S. Moore.]

***Rubus omeiensis.** (*K. B.* 1909, 259.) H. A shrub with unarmed velvety branches. Leaves simple, petiolate, shortly 5-lobed or sometimes obscurely 7-lobed, 3–9 in. long and broad, nearly glabrous above, hoary beneath, rugose; lobes sinuate or sublobate, irregularly toothed. Panicles terminal, many-flowered, sometimes rather congested. Petals erect, obovate-elliptic, 2 lin. long, purple. Fruit unknown. Mt. Omei, W. China. (J. Veitch & Sons.)

***Rubus Veitchii.** (*K.B.* 1909, 258.) H. A shrub with prickly terete branches. Leaves pinnate, 2½–6 in. long; leaflets 5–9; lateral elliptic or obliquely ovate, coarsely toothed, ½ in.–1¼ in. long; terminal ovate-lanceolate or rhomboid, 1¾–3⅜ in. long, coarsely toothed or almost pinnatifid; all green and puberulous or silky-hairy above, hoary beneath; rhachis prickly, pubescent. Panicles terminal, few-flowered. Petals orbicular-obovate, 1½ lin. long, purple. Fruit globose, red. W. China. (J. Veitch & Sons.)

***Saccolabium penangianum.** (*O. R.* 1909, 351.) Orchidaceae. S. A small plant, only a few inches high. Leaves lanceolate, acute, 2¼–3 in. long, ¼ in. broad. Spike cylindric, densely-flowered, about 1 in. long. Rhachis and pedicels pubescent. Flowers with light yellow sepals, puberulous outside, otherwise whitish, with the side lobes of the lip and wings of the column narrowly margined with purple. Spur about twice as long as the sepals. Malay Peninsula. (Kew.)

Saccolabium platycalcaratum. (*K. B.* 1909, 368.) S. Belongs to the section *Calceolaria* and is distinguished by the much flattened apex of the spur. A dwarf herb. Leaves oblong or elliptic-oblong, 1¾–2½ in. long, 7½–10 lin. broad. Scapes axillary, up to 2 in. long. Racemes short, 6–9-flowered. Flowers very small, with the sepals and petals yellow, spotted with brown, and the lip whitish, green on the fleshy centre of the front lobe. Upper Burma. (F. Sander & Sons.)

Salix Bakeri. (*M. D. G.* 1908, 154.) Salicaceae. H. A tree with slender pendulous branches. Trunk dark brown; young branches green, red on the side exposed to the sun. Leaves long-stalked, elongate-lanceolate, undulate, slightly toothed, pale green above, ash-grey beneath, with white midrib; stipules broadly cordate, amplexicaul, acuminate. N. America. (L. A. Dode, Paris; C. Sprenger, Naples.)

Salix Bonplandiana. (*M. D. G.* 1908, 154.) H.? A tall tree. Trunk ash-grey; young branches yellowish-green, rust-coloured or purple-dotted on the side exposed to the sun. Leaves long-stalked, lanceolate, long-acuminate, serrulate, with two warts at the base; petiole red; stipules cordate, semi-amplexicaul. N. America? Mexico. (L. A. Dode, Paris; C. Sprenger, Naples.)

Salix chrysocoma. (*B. S. B. F.* 1908, 655, f.) H. A hybrid between *S. babylonica* and *S. vitellina*. (L. A. Dode, Paris; L. Späth, Berlin.)

Salix Hankensonii. (*B. S. B. F.* 1908, 655, f.) H. Apparently a natural hybrid between a species of the group of *S. nigra* and one of the group of *S. babylonica*. New York. (L. A. Dode, Paris.)

Salix heterandra. (*B. S. B. F.* 1908, 654, f.) H. Shrub. Branches more or less torulose, thickish, glabrous, black or brown, shining. Leaves lanceolate-obovate or narrowly lanceolate, 3–4 in. long, remotely serrate, glabrous, light green above, whitish-glaucous beneath; petiole up to ½ in. long. Male catkins arcuate, about 1¾ in. long. Possibly a hybrid

between a species of the *S. purpurea* group and one allied to *S. pentandra*. Caucasus. (L. A. Dode, Paris.)

Salix lispoclados. (*B. S. B. F.* 1908, 651, f.) H. Intermediate between the group of *S. alba* and that of *S. pentandra*. Branches suberect, the younger shining, reddish. Leaves ovate-lanceolate, about 2½ in. long and ⅔ in. broad, serrate, light green and shining above, whitish-glaucous beneath. Male catkins appearing late, subconical, 5½-7 lin. long, 2½–3½ lin. broad. Caucasus. (L. A. Dode, Paris.)

Salix Medwedewii. (*B. S. B. F.* 1908, 652, f.) H. Allied to *S. triandra*. Shrub or small tree, with erect very slender branches, even the younger of which are glabrous and brown. Leaves very narrow, up to 4 in. long and 2½–3 lin. broad, glandular-serrate, whitish-glaucous beneath; nerves yellowish; petiole 2–3 lin. long, reddish. Female catkins appearing late, cylindric, 1¼ in. long, 1½ lin. broad, rather dense. Caucasus. (L. A. Dode, Paris.)

Salix oxica. (*B. S. B. F.* 1908, 653.) H. Apparently allied to *S. fragilis* and easily recognised by its large glaucescent leaves, which give to the whole tree a bluish appearance. Central Asia. (L. A. Dode, Paris.)

Salix persica. (*M. D. G.* 1908, 154.) H. Similar to *S. babylonica*. Trunk pale ash-grey or brownish; young branches green, brownish on the side exposed to the sun. Leaves very shortly stalked, somewhat falcate, long-acuminate, serrulate, pale green above, greyish beneath; stipules wanting. Persia; Bokhara. (L. A. Dode, Paris; C. Sprenger, Naples.)

Salix renecia. (*B. S. B. F.* 1908, 656, f.) H. A hybrid of which *S. cinerea* is a parent. France. (L. A. Dode, Paris.)

Salix Tominii. (*B. S. B. F.* 1908, 652, f.) H. Belongs to a group allied to that including *S. alba*. Tree with spreading branches, the older blackish, shining; apex of shoots with white woolly hairs. Leaves obovate to lanceolate, 3½–4 in. long or more, ¾ in. broad, remotely serrate, at first silky-hairy on both sides, afterwards glabrate above and silky-hairy and whitish-glaucous beneath, somewhat rounded at the base; petiole 2½–4 lin. long, villose. Male catkins at first conical and rosy at the apex, afterwards ovate-cylindric, ¾ in. long, ⅓ in. broad. Stamens 2; filaments connate at the base. W. Asia. (L. A. Dode, Paris.)

Sambucus. (*M. D. G.* 1909, 1–56, ff.) Caprifoliaceae. H. Many new varieties or forms of *S. nigra*, *S. canadensis*, *S. racemosa*, *S. Ebulus* and other species are described by Fritz Graf von Schwerin. Several appear to be in cultivation, but they are chiefly of botanical interest only.

Sambucus nigra latisecta. (*Hesse Cat.* 1909–10, 160.) H. Characterized by its broadly lobed leaves. (H. A. Hesse, Weener, Hanover.)

***Saxifraga apiculata alba.** (*G. C.* 1909, xlv. 238; *Gard.* 1909, 195, 201, f.) Saxifragaceae. Flowers pure white or pale cream-coloured, borne freely on stems about 3 in. high. (Guildford Hardy Plant Nursery.)

***Saxifraga Clibranii.** (*G. C.* 1909, xlv. 300, f. 130; *G. M.* 1909, 371.) H. A free-flowering plant with a distinct habit. Flowers deep red, ½ in. across. (Clibrans.) [A form of *S. decipiens*, Ehrh.]

Saxifraga decipiens Arkwrightii. (*G. C.* 1909, xlv. 300, 314, f. 135; *G. M.* 1909, 371.) H. A handsome free-flowering variety. Flowers flattish, pure white, about ¾ in. across. (Baker & Co.)

Saxifraga intermedia. (*G. C.* 1909, xlvi. 195, f. 81.) H. Intermediate between *S. Stribnryi* and *S. Grisebachii* and apparently a natural hybrid between these species. (Kew.)

***Saxifraga madida.** (*G. C.* 1909, xlv. 20; xlvi. 370, f. 161.) H. An autumn-flowering species closely allied to *S. Fortunei*, but its leaves are more deeply 8- or 9-lobed. Petals entire. Japan. (Kew.)

Saxifraga scardica. (*B. M.* t. 8243.) H. A densely tufted herb. Lower leaves oblong, acute, ¼–⅔ in. long, ⅒–⅛ in. broad, rigid, with cartilaginous edges and 9–15 submarginal pits. Flowering-stems erect or ascending, 3–4½ in. long, 3–11-flowered, glandular-hairy, reddish, bearing scattered narrowly-oblong leaves. Calyx glandular-hairy outside; lobes subacute. Petals white, oblanceolate, 5-nerved, about ⅖ in. long. Balkan Peninsula. (Kew.) [This is the true *S. scardica*, Griseb. The plant usually met with in gardens under this name was figured in *B. M.* t. 8058, but it differs from the type in having subacute lower leaves, with fewer submarginal pits, 1–3-flowered green stems, and obtuse less pubescent calyx-lobes. It has been named *S. scardica* var. *obtusa*.]

***Saxifraga Stribnryi.** (*G. C.* 1909, xlv. 259 ; xlvi. 195, f. 81 ; *Gard.* 1909, 212, 214, f.) H. Leaves in rosettes similar to those of *S. Grisebachii*. Inflorescences drooping like those of *S. media*, but more branched. Stems, branches and flowers covered with glandular more or less red-tinted hairs. Bulgaria. (R. Farrar ; Kew.)

***Sempervivum poculiforme.** (*I. S. H. T.* vi. t. 234.) Crassulaceae. G. Stem simple, erect, more or less elongated. Basal leaves numerous, in a rosette, oblong-lanceolate, cuneate at the apex, serrate-ciliate, otherwise glabrous ; stem-leaves obovate-spathulate. Flowers in a panicle-like inflorescence with glabrous branches. Calyx glabrous ; teeth 9, lanceolate-triangular. Petals 9, lanceolate, acute, about twice as long as the calyx. Canary Islands ? (L. van den Bossche, Tirlemont, Belgium.)

***Senecio clivorum subcrenata.** (*Veitch N. H. P.* 1909, 6, f.) Compositae. H. Rather less robust than the type and less compact in habit. Leaves rounded, subcrenate. Flower-heads orange-yellow, smaller than in type. China. (J. Veitch & Sons.)

Senecio scandens. (*R. H.* 1909, 406, f. 171.) H. A woody climbing plant reaching a height of several yards. Branches slender, slightly hirsute. Leaves rather small, shortly petiolate, simple or with 2 or 3 leaflets at the base, elliptic-lanceolate, acute, bordered with small triangular teeth, greyish-green, finely pubescent on both sides. Flower-heads yellow, about ¾ in. across, in lax terminal corymbs ; ray-florets about 8. Himalaya ; China. (Ph. L. de Vilmorin, Verrières-le-Buisson, France.) [This is *S. scandens*, Buch.-Ham., and is distinct from *S. scandens*, Hort., which is synonymous with *S. mikanioides*, Otto.]

***Sinofranchetia sinensis.** (*K. B.* 1909, 355.) Berberidaceae. H. A new genus allied to *Holboellia* and *Stauntonia*. It is a tall deciduous climber, with a main stem up to 3 or 4 in. thick. Leaves ternate, glaucous ; petiole 6–9 in. long. Flowers dull white, inconspicuous. Fruits 3 together at intervals on a rhachis 8 in. long or more, blue-purple, each about the size of an average grape. Central and W. China. (Arnold Arboretum ; Kew.)

***Sinowilsonia Henryi.** (*K. B.* 1909, 355.) Hamamelidaceae. H.? A deciduous shrub or small tree, sometimes over 20 ft. high. Leaves broadly elliptic to obovate, resembling those of a lime, 3–6 in. long, strongly veined and densely stellate-pubescent beneath, bristly-toothed. Flowers greenish, in slender pendulous racemes 9 in. long. Central China. (Arnold Aboretum.)

Sobralia Colmanii. (*G. C.* 1909, xlvi. 99 ; *O. R.* 1909, 276.) Orchidaceae. S. A garden hybrid between *S. xantholeuca* and *S. Veitchii*. (Sir J. Colman.)

Sobralia Elisabethae. (*G. C.* 1909, xlv. 83.) S. Stems 3 ft. high. Leaves distant, lanceolate, 5–6 in. long. Flowers about 9, produced in succession, in terminal flexuose racemes. Sepals and petals white, 2 in. long, the former lanceolate, the latter ovate, acute. Lip forming a tube around the column, expanded in front, emarginate, crisped, white with a chrome-yellow disk and faint rose lines from the base. Guiana. (Birmingham B. G.) [*S. Liliastrum*, Lindl.]

***Sobralia valida.** (*K. B.* 1909, 65.) S. Stems robust, glabrous, 8–10 in. high, 3- or 4-leaved. Leaves broadly elliptic, 5–8 in. long, 2½–3½ in. broad, amplexicaul, subacute, somewhat plicate. Spathe shortened, rather leafy. Flowers about 2 in. long, few, opening successively, fragrant, whitish-yellow, with a deeper yellow band on the lip, becoming deep orange in front. It belongs to a small group having an arrested inflorescence, glabrous leaf-sheaths, and a lip with crested veins. Panama. (Kew.)

Sophro-cattleya Blackii. (*G. C.* 1909, xlvi. 174 ; *O. R.* 1909, 314, 361, f. 28 ; *G. M.* 1909, 706.) Orchidaceae. G. A garden hybrid between *Sophronitis grandiflora* and *Cattleya Hardyana*. (R. G. Thwaites.)

Sophro-cattleya Thwaitesii. (*G. C.* 1909, xlv. 174 ; *J. of H.* 1909, lviii. 295, f., as *S.-c. Thwaitesae*.) G. A garden hybrid between *S. grandiflora* and *Cattleya Mendelii*. (R. G. Thwaites.)

***Sorbus japonica.** (*Späth Cat.* 1909–10, 122 ; *Hesse Cat.* 1909–10, 163.) Rosaceae. H. Differs from *S. Aucuparia* in being glabrous and in having the bright green leaves of the same colour on both sides. The flowers have the disk hairy only around the style. See *Gfl.* 1901, 408. Japan. (L. Späth, Berlin ; H. A. Hesse, Weener, Hanover.) [Syn. *Pyrus Aucuparia*, Ehrh. var. *japonica*, Franch. & Sav.]

***Sorbus Vilmorini.** (*B. M.* t. 8241.) H. The correct name of the plant included in the list of 1904 as *Cormus foliolosa*.

Spiraea Ramaleyi. (*Späth Cat.* 1909–10, 123.) Rosaceae. H. Resembles *S. intermedia*, but the leaves are more hairy and the young shoots are brownish. It is stated to be a strong-growing shrub about 8 ft. high, with large clusters of white flowers. Colorado. (L. Späth, Berlin.) [Syn. *Physocarpus Ramaleyi*, Nelson.]

Spiraea venusta magnifica. (*G. C.* 1909, xlvi. 99; *G. M.* 1909, 634, f.) H. Flowers larger and of a richer colour than in the type. (A. Perry.)

Stanhopea convoluta. (*K. B.* 1909, 366.) Orchidaceae. S. Pseudobulbs ovoid or ovoid-oblong, about 2 in. long. Leaves petiolate, elliptic or elliptic-oblong, 12–14 in. long, 3¾–6 in. broad, 5–7-nerved. Scape short, 2-flowered. Sepals somewhat spreading, concave, about 3 in. long, 1½–1¾ in. broad, ivory-white. Petals connivent, enveloping the column, 2 in. long, 1¼ in. broad, ivory-white, with buff tips. Lip 3-lobed, very fleshy, 1¾ in. long, buff-yellow, with the interior of the sac orange. Colombia. (Fl. Claes, Etterbeek, Brussels.)

***Staphylea colchica Hessei.** (*Hesse Cat.* 1909–10, 168.) Sapindaceae. H. A fine form with bright rose-coloured flowers. (H. A. Hesse, Weener, Hanover.)

***Staphylea lobocarpa.** (*Lemoine Cat.* 1909, n. 173, vii.) H. A shrub 9–22 ft. high, with white or rose flowers. Central China. (V. Lemoine & Son, Nancy.) [*S. holocarpa*, Hemsl. in K. B. 1895, 15.]

Stereospermum sinicum. (*S. C. A. A. Cat.* 1908, 20.) Bignoniaceae. G. A rapid-growing tree reaching a height of 60 ft., with ornamental bipinnate leaves and upright panicles of large pinkish-white flowers. S. China. (Southern California Acclimatizing Association.)

***Strophanthus Preussii.** (*B. M.* t. 8250.) Apocynaceae. S. A climbing shrub, with stems up to 2 ft. long. Leaves elliptic to obovate, sharply acuminate, 2–4 in. long, 1½–2 in. broad. Cymes terminal, pedunculate, usually many-flowered. Coralla yellowish-white or pale orange, the tube reddish, scales at the throat and the tails purple; tube nearly 1 inch long; lobes ovate, contracted into filiform tails which are up to 1 ft. long. W. Trop. Africa. (Kew.)

***Sycopsis sinensis.** (*K. B.* 1909, 356.) Hamamelidaceae. H. An evergreen shrub, up to 20 ft. high, resembling in habit the common hazel (*Corylus Avellana*). Leaves ovate-lanceolate, 2–4½ in. long, rather coriaceous, glabrous, slightly toothed or entire. Flowers in short dense racemes, chiefly conspicuous on account of their red stamens. (Arnold Arboretum; Kew.)

Symphoricarpus ovatus. (*Späth Cat.* 1909–10, 125.) Caprifoliaceae. H. A densely branched shrub with pendulous habit. Leaves dark bluish-green. Flowers campanulate, 3–4 lin. long, rose. Fruits white. (L. Späth, Berlin.)

Syringa persica rubra. (*M. D. G.* 1908, 191.) Oleaceae. H. A red-flowered form. (C. F. Niemetz, Temesvár, Hungary.)

Syringa velutina. (*M. D. G.* 1908, 191.) H. Similar to *S. Emodi rosea* and *S. Josikaea rosea*. Its flowers are of the same colour but they are smaller, less open, and appear much earlier. Panicles markedly smaller. Corea. (Simon-Louis frères, Plantières, Metz.)

***Tapiscia sinensis.** (*K. B.* 1909, 356, f.) Sapindaceae. H.? A small deciduous tree, usually about 30 ft. high. Leaves pinnate, 12–18 in. long, changing to yellow in autumn; leaflets ovate-cordate, 3–5 in. long, 1½–2½ in. broad, serrate, acuminate, greyish beneath. Flowers yellow, ⅛ in. long, fragrant, in axillary panicles 4–6 in. long. Fruit ovoid, black, ½ in. long. Central and W. China. (Arnold Arboretum; Kew.)

***Tetracentron sinense.** (*K. B.* 1909, 356. f.) Trochodendraceae. H. A tree reaching a height of 80 ft. or more. Leaves deciduous, alternate, broadly ovate, 4–5 in. long, subcordate at the base, serrate, with 5 or 7 prominent longitudinal nerves. Flowers small, yellowish, in slender spikes about 4 in. long. The tree resembles *Cercidiphyllum japonicum* and belongs to the same order, which is closely allied to Magnoliaceae. Central and W. China. (J. Veitch & Sons.)

Tilia Miyabei. (*M. D. G.* 1909, 285.) Tiliaceae. H. A very handsome tree reaching a height of nearly 100 ft., with a trunk 3–5 ft. thick. Bark, leaves, flowers and fruit similar to those of *T. Michauxii*. Japan. (Arnold Arboretum.) [Syn. *T. Maximowicziana*, Shirasawa.]

***Tilia Oliveri.** (*Veitch N. H. P.* 1909, 6.) H. Similar in habit to *T. argentea*.

Leaves cordate, glabrous above, white-tomentose beneath. See *Hook. Ic. Plant.* sub t. 1927. Central China. (J. Veitch & Sons.)

***Tinnea Sacleuxii.** (*I. S. H. T.* vi. t. 238.) Labiatae. S. A dwarf shrub. Branches shortly and densely pubescent. Leaves shortly stalked, oblong or ovate, entire, ¾–1 in. long, ⅔ in. broad. Cymes axillary, 2–5-flowered. Calyx membranous, deeply 2-lipped, persistent. Corolla nearly 1 in. long, 2-lipped, the lower lip much longer than the upper. Near *T. aethiopica*, but the flowers are not solitary and the calyx is deeply 2-lipped. Tropical Africa? (C. Sprenger, Naples; L. van den Bossche, Tirlemont, Belgium.)

Tradescantia hypophaea. (*Gfl.* 1909, 17.) Commelinaceae. S. Remarkable for the red-brown colouring of the foliage in late summer. S. America. (G. Bornemann, Blankenburg, Germany.) [*T. geniculata*, Jacq.]

***Tripterygium Wilfordii.** (*M. D. G.* 1909, 283.) Celastraceae. H. A shrub resembling in habit *Rubus Idaeus*. Branches straight, curved or often zigzag, 3–6 ft. long, somewhat 5-angled, glabrous, clothed with numerous small warts. Leaves alternate, ovate or ovate-oblong, often 4–6 in. long, abruptly acuminate, serrulate, rounded at the base. Panicles terminal, up to 8 in. long. Flowers small, numerous, greenish-white, fragrant. Fruits 3-winged, usually about ⅔ in. long and nearly as broad. Corea, Central China, Formosa. (Arnold Arboretum.)

***Trollius pumilus yunnanensis.** (*Veitch Herb. P.* Nov. 1909–10, 5, f.) A distinct plant not unlike *Caltha palustris* in habit, with dark green leaves and bright golden-yellow flowers. China. (J. Veitch & Sons.)

Tunica Saxifraga alba plena. (*G. C.* 1909, xlvi. 99; *G. M.* 1909, 634.) Caryophyllaceae. H. A form with white double flowers. (Baker & Co.)

Valeriana ceratophylla. (*R. H. B.* 1909, 369.) Valerianeae. H. H. A slender sparingly leafy plant reaching a height of 16 in. Flowers snow-white, in terminal umbels. Mexico.

***Viburnum Henryi.** (*Veitch N. H. P.* 1909, 7, f.; *R. H. B.* 1909, 296, f.) Caprifoliaceae. H. An evergreen shrub. Leaves lanceolate, 3–5 in. long, 1–1½ in. broad, glossy green, serrate; midrib yellow, prominent. Flowers white, very small, in terminal pyramidal panicles. Fruits coral-red. Central China. (J. Veitch & Sons.)

***Viburnum Hessei.** (*Gfl.* 1909, 89, 266, f. 6; *Hesse Cat.* 1909–10, 180.) H. A dwarf densely branched shrub. Leaves strongly plicate at the base, rounded to rounded-ovate, 2½–3¼ in. long, 2–2¼ in. broad, acuminate, rounded or subcordate at the base, shortly and very broadly toothed, more or less hairy in the axils of the nerves beneath or glabrate. Corymbs shortly pedunculate, ¾–1¾ in. across. Flowers pure white. Fruits coral-red. Closely allied to *V. Wrightii*. Probably China or Japan. (H. A. Hesse, Weener, Hanover.)

Viburnum Tinus macrophyllum. (*M. D. G.* 1908, 155, 220.) H. Leaves up to nearly 6 in. long and 3⅓ in. broad. Inflorescences as large again as those of the type. Flowers reddish. Corfu.

***Viola Rydbergi.** (*G. M.* 1909, 283.) Violaceae. H. A vigorous-growing species, reaching a height of 9–12 in., and bearing large white flowers slightly tinged with purple. N. America. (S. Arnott.)

Vitis vomerensis. (*Gard.* 1909, 188.) Ampelidaceae. H. A very robust plant with brown-felted stems. Leaves large, leathery, deeply cut into fine lobes, covered with a light brown tomentum, deep olive-green when fully developed. (Observed in a Nice villa garden.)

***Vitis Wilsonae.** (*G. C.* 1909, xlvi. 236, f. 101.) H. Belongs to the *V. armata* group. Leaves almost regularly 5-sided, with a circular depression at the base, the principal veins terminating in small points, otherwise almost entire, becoming deep red in autumn. China. (J. Veitch & Sons.)

Wedelia oblonga. (*G. C.* 1909, xlv 18.) Compositae. H. H. A glandular-hairy herb, reaching a height of almost 3 ft. Leaves oblong or oblong-lanceolate, acute, 3–3½ in. long, ¾–1 in. broad. Peduncles 1½–2 in. long. Flower-heads lemon-yellow, 1½–2 in. across; outer bracts leaf-like, ovate-lanceolate, about ⅓ in. long; inner somewhat scarious; ray-florets about 12, 3-toothed. Brit. E. Africa. (J. Veitch & Sons.)

Xanthosoma nuevo-leonense. (*S. C. A. A. Cat.* 1908, 10, as *Anthosoma*.) Araceae. S. The "colossal elephant's ear," growing to 6 ft. high, with very large leaves which stand almost horizontal. Mexico. (Southern California Acclimatizing Association.)

Xylosma Salzmanni. (*S. C. A. A. Cat.* 1908, 13.) Bixaceae. S. A shrub bearing straight spines sometimes 2 or 3 in. long or more. Leaves very variable in shape and size, usually elliptic, 1½–4 in. long, serrate. Flowers very small, in auxiliary clusters. Fruits small, black, resembling bilberries. Brazil. (Southern California Acclimatizing Association.)

Yucca Draco. (*B. T. O.* 1909, 180.) Lilaceae. G. A garden hybrid between *Y. flaccida* and *Y. aloifolia*. (C. Sprenger, Naples.)

Zygocolax Charlesworthii. (*G. C.* 1909, xlvi. 364; *G. M.* 1909, 947.) Orchidaceae. G. A garden hybrid between *Zygopetalum Perrenoudii* and *Colax jugosus*. (Charlesworth & Co.)

Zygonisia Sanderi. (*G. C.* 1909, xlv. 174.) Orchidaceae. G. A garden hybrid between *Aganisia lepida* and *Zygopetalum* sp. (F. Sander & Sons.)

Zygopetalum Clarksonii. (*G. C.* 1909, xlv. 301; *O. R.* 1909, 156.) Orchidaceae. G. A garden hybrid between *Z. crinitum* and *Z. Clayi*. (H. S. Goodson.)

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1910.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. D. Prain, I.M.S., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A., F.L.S.
Assistant (Office) - - -	*John Aikman.
,, ,, - - -	*William Nicholls Winn.

Keeper of Herbarium and Library	Otto Stapf, Ph.D., F.R.S., F.L.S.
Assistant Keeper (Cryptogams) -	George Massee, F.L.S.
,, ,, (Phanerogams)-	Charles Henry Wright, A.L.S.
,, ,, (Herbarium) -	Nicholas Edward Brown, A.L.S.
,, (Herbarium) - -	*Robert Allen Rolfe, A.L.S.
,, ,, - -	*Sidney Alfred Skan.
,, ,, - -	Thomas Archibald Sprague, B.Sc., F.L.S.
,, ,, - -	Arthur Disbrowe Cotton, F.L.S.
,, ,, - -	Jessie Jane Clark, B.Sc.
,, ,, - -	Elsie Maud Wakefield.
,, for Tropical Africa -	*John Hutchinson.
,, for India - - -	William Grant Craib, M.A.

Assistant Keeper (Jodrell Laboratory).	Leonard Alfred Boodle, F.L.S.

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Royal Botanic Gardens, Kew—*continued.*

Keeper of Museums - - -	John Masters Hillier
Assistant (Museums) - - -	*John H. Holland, F.L.S.
" " - - -	*William Dallimore.
Preparer - - - - -	George Badderly.

Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Arboretum - - - - -	*Arthur Osborn.
Greenhouse and Ornamental Department.	*John Coutts.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - - -	*George Dear.

Aberdeen.—University Botanic Garden :—

Professor - - -	J. W. H. Trail, M.A., M.D., F.R.S., F.L.S

Cambridge.—University Botanical Department :—

Professor - - -	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	C. E. Moss, D.Sc.
Curator, University Museum.	H. H. Thomas, B.A.
Curator of Garden -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - -	Frederick W. Moore, M.A., A.L.S.
Assistant - - -	*C. F. Ball.

Trinity College Botanic Gardens :—

Professor - - -	H. H. Dixon, Sc.D., F.R.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	I. B. Balfour, M.A., M.D., LL.D., Sc.D., F.R.S., F.L.S.
Assistant (Museum) -	H. F. Tagg, F.L.S.
" (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	James Whitton.

Oxford.—University Botanic Garden :—

	Professor - - -	SydneyH.Vines, M.A., Sc.D., F.R.S., F.L.S.
	Curator · - -	*William Baker.

AFRICA.

British East Africa Protectorate.—

Nairobi -	Director of Agriculture.	Hon. A. C. Macdonald.
	Assistant - - -	*Henry Powell.
	Conservator of Forests	D. E. Hutchins.

Cape Colony.—

Cape Town -	Hon. Curator, Government Herbarium.	Prof. H. H. W. Pearson, M.A., Sc.D., F.L.S.
	Conservator of Forests	J. S. Lister, I.S.O.

Gardens and Public Parks :—

	Superintendent - -	H. J. Chalwin.

Grahamstown.—Albany Museum :—

	Superintendent of Herbarium.	S. Schönland, Ph.D., F.L.S.

Gardens and Public Parks :—

	Curator - - -	E. J. Alexander.
Port Elizabeth -	Superintendent - -	John T. Butters.
King Williamstown.	Curator - - -	George Lockie.
Graaff-Reinet -	,, - - -	*C. J. Howlett.
Uitenhage -	,, - - -	H. Fairey.

Egypt.—

Cairo.—Khedivial Agricultural Society :—

Secretary - - -	G. P. Foaden, B.Sc.

Gold Coast.—Botanic and Agricultural Department :—

Director of Agriculture.	W. S. D. Tudhope.
Travelling Instructor	*Alfred E. Evans.
Curator - - -	A. F. Gear.
,, - - -	*Robert Band.
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